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WELL COMPLETION REPORT

MONITORING WELLS TW-59, TW-60, TW-61 AND TW-62

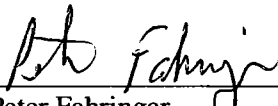
MONSANTO SODA SPRINGS PLANT


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LIST OF ACRONYMS AND ABBREVIATIONS

amsl	Above Mean Sea Level
bgs	Below Ground Surface
btc	Below Top of Casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
IDEQ	Idaho Department of Environmental Quality
ERI	Electrical Resistivity Imaging
Ft/d	Feet per Day
gpm	Gallons per Minute
LBZ	Lower Basalt Zone
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
ROD	Record of Decision
UBZ	Upper Basalt Zone
UFS	Underflow Solids (Pond)
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

This report summarizes the results of the drilling, geophysical logging, installation, development, and falling head testing of four shallow monitoring wells: TW-59, TW-60, TW-61, and TW-62 completed in the Upper Basalt Zone (UBZ) aquifer south of the Monsanto Soda Springs Plant on Monsanto property. The additional monitoring wells were requested by the U.S. Environmental Protection Agency (USEPA) and Idaho Department of Environmental Quality (IDEQ) following review of groundwater conditions south of the Plant site. The monitoring wells were installed to collect additional groundwater elevation and groundwater quality data to define the downgradient extent of the plume originating from the old Underflow Solids (UFS) Ponds. The monitoring wells were drilled and completed between June 21, 2007 and July 8, 2007.

A Golder Associates Inc. Hydrogeologist observed and documented the drilling and well completion, collected formation samples, and prepared geologic and well completion logs.

The wells were drilled and completed as follows:

- A 10-inch diameter borehole was drilled and temporarily cased to a depth of 16 to 20 feet below ground surface;
- An 8-inch diameter open borehole was drilled from the base of the temporary casing to the total well depth using air-rotary methods.
- Geophysical logs (natural gamma, single-point resistance, self (or spontaneous) potential, and caliper) were collected to determine the interval to be screened.
- The wells were screened at the desired depth and completed using 4-inch diameter PVC casing to two to three feet above ground surface.
- Silica sand, bentonite chips, and bentonite grout were added to the annular space as needed to properly complete the well;
- The wells were developed using airlift pumping and surging methods to establish a good hydraulic connection to the aquifer by removing drill cuttings and fine formation materials from the screened interval; and
- All wells were completed with permanent sampling pumps and locking steel monuments, concrete pads, and protective posts.

Following completion, rising head tests were completed on each newly completed well to estimate the hydraulic conductivity of the completion interval. A groundwater quality sample was collected from each new well following development. The new wells were added to the list of wells and springs that are sampled as part of the annual groundwater sampling at the site.

1.0 INTRODUCTION

This report summarizes the results of the drilling, geophysical logging, installation, development, and falling head testing of four shallow monitoring wells (TW-59, TW-60, TW-61, and TW-62) completed in the UBZ aquifer south of the Monsanto Soda Springs Plant on Monsanto property. The additional monitoring wells were requested by the USEPA and IDEQ following review of groundwater conditions south of the Plant site. The monitoring wells were installed to collect additional groundwater elevation and groundwater quality data to define the downgradient extent of the plume originating from the old Underflow Solids (UFS) Ponds. The monitoring wells were drilled and completed between June 21, 2007 and July 8, 2007.

This report is organized into the following sections:

- **Section 2** presents a brief background section that includes a description of existing groundwater monitoring wells and groundwater conditions present at the site;
- **Section 3** presents the approach to the field investigations;
- **Section 4** describes the geophysical surveys to locate monitoring wells, monitoring well drilling and construction, and monitoring well testing and sampling; and
- **Section 5** includes references.

All work was performed in accordance with the project Work Plan (Golder 2006a) and quality assurance/quality control procedures presented in the Quality Assurance Project Plan (QAPP) developed for the Phase II Remedial Investigation (Golder 1992) and for the new monitoring wells (Golder 2006b).

2.0 BACKGROUND

The Monsanto Soda Springs Plant (Plant) is located one mile north of the City of Soda Springs, Caribou County, Idaho (Figure 1). The site covers an area of approximately 800 acres, with the fenced plant site accounting for 540 acres.

Monsanto purchased agricultural land in 1952 to construct the Soda Springs elemental phosphorus production plant. The Plant uses locally mined phosphate ore. In 1984, Golder Associates Inc. (Golder) was retained to assess the impact of operations on groundwater and surface water quality at the Plant. The 1984 study found elevated concentrations of cadmium, selenium, fluoride and sulfate in groundwater beneath the Plant. The sources of these constituents were determined to be the old Underflow Solids (UFS) Ponds, the Northwest Pond, and the old hydroclarifier. The investigation also concluded that groundwater under the southeastern portion of the plant contained elevated concentrations of vanadium, chloride, and sulfate. Based on groundwater flow directions and geochemical data, the elevated concentrations in the southeastern portion of the Plant were attributed to the Kerr-McGee Chemical Corporation located to the east of the Plant, across Highway 34 from the Plant and was further supported by findings from a CERCLA site inspection conducted in 1988.

Monsanto conducted and submitted to the USEPA a Remedial Investigation (RI) in 1992 (Golder 1992) and a Phase II RI in 1995 (Golder, 1995). A Record of Decision (ROD) was signed by Monsanto and the U.S. Environmental Protection Agency in 1997. The selected remedy for groundwater is monitored natural attenuation. Bi-annual groundwater monitoring was in place from 1991 to 1998, and annual groundwater monitoring has occurred since 1998. Annual groundwater and effluent discharge monitoring is conducted at and near the Plant in order to ensure that natural attenuation is proceeding per modeled predictions (Golder, 2003), and to monitor the attenuation process.

2.1 Hydrogeology

The hydrogeology at the Monsanto Plant is described in detail in Golder (1995). The primary hydrostratigraphic zones underlying the Monsanto Plant include the Upper Basalt Zone (UBZ) and the Lower Basalt Zone (LBZ). The principal aquifer is the UBZ which extends to a depth of 100 feet bgs below the plant. Depth to the water table ranges from 20 feet below ground surface (bgs) in the northeast corner to 100 feet bgs in the center of the plant. Groundwater flow in the UBZ and LBZ is a function of faulting, regional hydrogeologic conditions, and pumping of the plant production wells. The UBZ and LBZ are broken into smaller regions (UBZ-1 through UBZ-4 and LBZ-1 through LBZ-4), based on hydrogeological controls and groundwater quality. Details pertaining to the breakdown of UBZ and LBZ regions are provided in Golder (1992).

2.2 Existing Wells

Groundwater affected by Monsanto activities is mainly confined to the Upper Basalt Zone (UBZ) within the plant, with groundwater flow southward toward the south plant fenceline and Soda Creek. Plume migration originating in the UBZ-2 from the old UFS Pond within the plant boundaries is monitored by South Fence Line wells TW-20, 34, 35, and 39. South of the plant fenceline, the plume is monitored by Southern Plant Boundary wells TW-53 through TW-56; inclusive. The South Fence Line wells are located inside the southern plant fence line immediately north of Hooper Springs Road (Figure 1); the Southern Plant Boundary wells are located within Monsanto property about 1,200 feet south of the Plant site (Figure 1).

2.3 Groundwater Conditions

The most recent annual groundwater monitoring results at the Monsanto Soda Springs Plant is summarized in the 2006 Summary Report (Golder, 2007a). The report is based on groundwater quality data collected up to and including the August 2006 sampling round (completed August 8 to 16, 2006). Results show concentrations of several constituents of concern (cadmium, selenium and nitrate) are increasing in South Fenceline wells (TW-20, TW-39), Southern Boundary wells (TW-53, TW-54, and TW-55), and in several offsite, downgradient springs (Mormon A and Homestead Springs) in the UBZ-1 and UBZ-2 zones. Chemical isopleth maps (Golder, 2007a) indicate the plume in UBZ-2 originating from the old underflow solids ponds has extended beyond the Southern Boundary wells and appears to be migrating towards Soda Creek. Groundwater in other portions of the Plant site (UBZ-4) is controlled by pumping of the plant production wells or originates from non-Plant activity (Kerr-McGee).

3.0 APPROACH

USEPA and IDEQ requested that Monsanto install additional monitoring wells south of the southern boundary wells to:

1. Define the downgradient extent of the UBZ-2 plume;
2. Evaluate groundwater elevations and groundwater flow directions in the area between the southern boundary wells and Soda Creek; and
3. Evaluate concentrations of constituents of concern to monitor natural attenuation.

To meet these goals, the following tasks were performed:

- Electrical Resistivity Imaging (ERI) geophysical surveys were conducted to evaluate subsurface conditions and map zones of elevated groundwater conductivity which may correlate to affected groundwater;
- Interpretation of the geophysical surveys was completed (Golder 2007b) to locate monitoring wells;
- Drilling, installation, and development of monitoring wells TW-59, TW-60, TW61 and TW-61 took place in June and July 2007. Dedicated sampling pumps were installed in each new monitoring well;
- Rising head tests were performed to determine the hydraulic conductivity of each well completion interval; and
- The groundwater at each well was sampled in July 2007 to evaluate concentrations of the constituents of concern.

4.0 FIELD INVESTIGATIONS

This section details the field methods and procedures followed during the location, construction, installation, development, and sampling of the additional groundwater monitoring wells.

4.1 Surface Geophysical Investigations

Surface geophysical investigations were performed using the Electrical Resistivity Imaging (ERI) method to evaluate subsurface conditions in the area south of the Southern Boundary Wells. ERI methodology, field program, data interpretation and summary of results of the geophysical survey were presented in a technical memorandum (Golder, 2007b).

The memorandum included interpreted geophysical cross sections and provided recommended locations for the new monitoring wells based on the geophysical survey results. Recommended locations for the new monitoring wells were identified as A, B, C, and D, which were subsequently drilled and completed as TW-61, TW-62, TW-60, and TW-59, respectively.

Location A (TW-61) was recommended for the installation of a monitoring well because of the low apparent resistivity observed in this area along Line 2W. Upon completion of drilling the ERI results at this location were re-evaluated. Based on the stratigraphy, hydraulic conductivity, and geochemistry of the groundwater sampled at TW-61, the low apparent resistivity observed at this location may be the result of a shallow water-bearing zone that has deeper, sodic groundwater upwelling into the zone. Sodic groundwater is generally low in apparent resistivity because of the high dissolved solids content (Golder, 1995). The groundwater quality sample from TW-61 had elevated concentrations of bicarbonate, manganese, total dissolved solids, and calcium, indicative of sodic groundwater in this well.

Location B (TW-62) was recommended for the installation of a monitoring well because of the low apparent resistivity observed in this area along Line 2E. Based on the ERI data, this area appeared to be where the basalt flows observed in TW-53 through TW-56 could be more fractured. Upon completion of drilling the ERI results at this location were re-evaluated. The lithologic log of TW-62 (Appendix A) shows fractured and/or weathered basalt throughout most of this borehole. Only the interval from 27.5 to 48 feet bgs is not fractured. The low apparent resistivity observed in this area likely represents a zone of greater fracturing of the basalt or a thickening of the interbed separating the basalt flows.

Location C (TW-60) was recommended for the installation of a monitoring well because of the low resistivity between 720 and 950 feet along Line 3W. Based on the ERI data, the basalt was interpreted to possibly be more fractured at this location. Upon completion of drilling the ERI results at this location were re-evaluated. Similar to TW-61, the low resistivity at this location may be the result of a shallow water-bearing zone that has deeper, sodic groundwater that has a low apparent resistivity upwelling into the zone.

Location D (TW-59) was recommended for the installation of a monitoring well because of the low apparent resistivity observed across the eastern portion of Line 4E and the increased depth of low resistivity at this location. Upon completion of drilling the ERI results at this location were re-evaluated. The low apparent resistivity observed at this location and east along ERI Line 4E may be the result of a topographic effect where groundwater with elevated total dissolved solids (and low relatively low resistivity) is closer to ground surface along the topographically lower eastern portion of ERI Line 4E. Additionally, highly weathered basalt from 16 to 20 feet and a cinder zone at 27 to 28 feet bgs were observed at TW-59.

4.2 Monitoring Well Drilling

The boreholes for the groundwater monitoring wells were drilled by Boart-Longyear at locations delineated by the geophysical survey. A Golder Associates Inc. hydrogeologist observed, supervised and documented the drilling and well completion activities, collected formation samples, and prepared geologic and well completion logs. An Atlas-Copco TH-60 air-rotary rig was used to drill each of the boreholes. Temporary 10-inch diameter steel casing was installed in the upper 16 to 20 feet of each borehole using a casing hammer to minimize borehole stability problems. Below the surface casing, the boreholes were drilled as 8-inch diameter open holes in order to install 4-inch diameter PVC monitoring wells. The temporary casing was removed following grouting of the annular space.

Clean water from the Monsanto potable water supply was added to the drilling air to decrease dust during drilling above the water table. Once the water table was reached, the water mist was shut off.

A detailed discussion of the drilling activities is given in the following subsections for each new monitoring well. Geologic logs and well construction diagrams are provided in Appendix A.

4.2.1 TW-59

Well TW-59 was drilled, geophysically logged, and installed June 27, 2007. The location of TW-59 is approximately 30 feet north of the original planned drilling location (Location D from the surface geophysical survey). This was because the first borehole drilled at the intended location (TW-59A) was drilled to 65 feet below ground surface (bgs) on June 21, 2007, but subsequently abandoned with cement grout after collapsing within a highly fractured basalt zone at about 16 feet bgs.

To avoid caving problems, temporary 10-inch diameter steel casing was installed in the upper 20 feet of the borehole using a casing hammer. Below the surface casing, the borehole was drilled as an open hole with an 8-inch diameter bit to 63 feet bgs. Formation samples (cuttings) were collected and logged at 5-foot intervals from 15 to 60 feet and at the total depth of 63 feet bgs. Groundwater was denoted in the field by changes in lithology, penetration rate, and airlifted water. Airlift flow rates of 10 to 20 gallons per minute (gpm) were observed below a depth of about 40 feet. Field groundwater quality parameters (pH and conductivity) were periodically measured in water-bearing zones. The static water level in the borehole immediately after drilling was completed was 16.5 feet bgs. Well construction details are discussed in Section 4.4.

4.2.2 TW-60

Well TW-60 was drilled from June 28 to June 29, 2007, geophysically logged on June 29, 2007, and completed on June 30, 2007. A temporary 10-inch diameter steel casing was installed in the upper 16 feet of the borehole using a casing hammer to minimize borehole stability problems. Below the surface casing, the borehole was drilled as an open hole with an 8-inch diameter bit to 79 feet bgs. Formation samples (cuttings) were collected and logged at 12 feet and at 5-foot intervals from 15 to 75 feet bgs. Groundwater was denoted in the field by changes in lithology, penetration rate, and airlifted water between 25 and 27 feet and below 54 feet bgs. The upper water-bearing zone yielded little flow (less than 5 gpm) and drilling continued to locate a deeper water-producing zone. Field groundwater quality parameters (pH and conductivity) were periodically measured below 54 feet bgs. Airlift flows were about 15 to 30 gpm below 54 feet. The static water level in the borehole immediately after drilling was completed was 29.5 feet bgs. Well construction details are discussed in Section 4.4.

4.2.3 TW-61

Well TW-61 was drilled and geophysically logged on July 1, 2007. Well installation began July 1, 2007 and was completed July 2, 2007. A temporary 10-inch diameter steel casing was installed in the upper 20 feet of the borehole using a casing hammer to minimize borehole stability problems. Below the surface casing, the borehole was drilled as an open hole with an 8-inch diameter bit to 80 feet bgs. Formation samples (cuttings) were collected and logged at 5-foot intervals from 10 to 80 feet bgs during drilling. Groundwater was denoted in the field by changes in lithology, penetration rate, and airlifted water at approximately 60 feet bgs. Field groundwater quality parameters (pH and conductivity) were periodically measured in water-bearing zones below 60 feet bgs. Airlift flows were greater than 15 gpm below about 70 feet. The static water level in the borehole immediately after drilling was completed was 29.55 feet bgs. Well construction details are discussed in Section 4.4.

4.2.4 TW-62

Well TW-62 was drilled, geophysically logged, and installed on July 7, 2007. A temporary 10-inch diameter steel casing was installed in the upper 20 feet of the borehole using a casing hammer to minimize borehole stability problems. Below the surface casing, the borehole was drilled as an open hole with an 8-inch diameter bit to 67 feet bgs. Formation samples (cuttings) were collected and logged at 5-foot intervals from 5 to 60 feet bgs during drilling. Groundwater was denoted in the field by changes in lithology, penetration rate, and airlifted water from a fractured, cindery zone at approximately 47 feet bgs. Field groundwater quality parameters (pH and conductivity) were periodically measured in water-bearing zones below 47 feet bgs. Airlift flow rates ranged from about 20 to 50 gpm below 47 feet. The static water level in the borehole immediately after drilling was completed was 31.94 feet bgs. Well construction details are discussed in Section 4.4.

4.3 **Geophysical Borehole Logging**

After drilling to the desired total depth and prior to the installation of the wells, the boreholes were geophysically logged using natural gamma, single-point resistance, self (or spontaneous) potential, and caliper tools. The purpose of the geophysical borehole logging was to substantiate lithologic interpretations and to aid in stratigraphic correlation between wells. Comparison of natural gamma logs provides a rapid means to correlate stratigraphy in basaltic environments since high natural gamma activity correlates well with clayey interflow zones (Crosby and Anderson, 1971). Natural gamma and caliper information from the geophysical logging was considered along with observations of fractures during drilling when determining the intervals to be screened at each well. The geophysical well logs are presented in Appendix B.

4.4 **Monitoring Well Installation**

After reviewing the lithologic and geophysical logs, the wells were installed in the first saturated interflow zone intersected during drilling that appeared to produce sufficient water for sampling and represented the most permeable interflow zone. When necessary, the borehole was backfilled below the screened section with 3/8-inch sodium bentonite chips and/or pellets to the desired completion interval. The monitoring wells were constructed in accordance with the Idaho Administrative Procedures Act for Well Construction Standards Rules (IDAPA 37.03.09; IAC, 2005), and in accordance with Golder Technical Procedures TP-1.2-5 for Drilling, Sampling, and Logging of Soils (Golder, 1996a) and TP-1.2-12 for Monitoring Well Drilling and Installation (Golder, 1996b). An inventory of materials used, verification of completion depths, and time for completion was completed by the Golder Hydrogeologist onsite.

All monitoring wells were completed by Boart-Longyear using 4-inch diameter, flush-threaded, Schedule 40 PVC risers and well screens (0.020-inch slots) 10-feet in length. Well locations, construction details, and observed water levels are presented in Table 1. Well logs and construction diagrams for each new well are presented in Appendix A. Wells were completed with a 10-20 Colorado silica sand pack across the screened interval, and extended about three feet above the top of the screen. A 3 to 5-foot thick bentonite pellet seal was installed above the sand pack, and the remainder of the borehole annulus sealed with bentonite grout. All wells were completed with a locking steel monument, concrete pad, protective posts, and a permanent measuring point (Photo 1). After completion of all new wells, each well was geodetically surveyed for location, ground elevation, and measuring point elevation (to the nearest 0.01 foot) and tied into the current monitoring well network.



PHOTO 1 – Typical Surface Completion – TW-59

TABLE 1

Well Completion Information

Well Number	Northing (ID East - State Plane, NAD27 Feet)	Easting (ID East - State Plane, NAD27 Feet)	Depth Drilled (feet bgs)	Ground Elevation (feet amsl)	Top of Casing Elevation (feet amsl)	Screened Interval (feet bgs)	Depth to Water (feet btc)	Date Water Level Measured
TW-59	365,662.8	654,853.5	63	5,855.89	5,858.47	31.0-41.0	19.23	07/06/07
TW-60	366,126.7	653,945.1	79	5,866.98	5,869.42	46.0-56.0	31.67	07/06/07
TW-61	367,105.2	653,964.7	80	5,876.17	5,878.37	64.0-74.0	32.57	07/06/07
TW-62	366,945.5	655,320.4	67	5,878.67	5,881.09	50.6-60.6	31.94	07/08/07

4.5 Well Development

Well development was conducted after all the wells were completely installed and prior to groundwater sampling. Wells were developed by pumping the well using air-lift pumping and surging methods. Final well development was completed using the permanent sampling pumps. Field water quality parameters (pH, specific conductance, temperature, turbidity and dissolved oxygen) were monitored throughout development. Well development took place until the pumped water was free of material (e.g., cuttings and geologic materials,) representative of formation water, and the turbidity was less than 5 NTU. Table 2 provides a summary of the field water quality parameters measured at the completion of well development, just prior to groundwater sampling.

TABLE 2

Field Water Quality Parameters at Completion of Well Development

Well Number	Airlift Flow (gpm)	pH	Specific Conductance (μ S/cm)	Temperature (degrees C)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Date Measured
TW-59	5-10	6.64	562	9.0	1.03	7.52	07/10/07
TW-60	5-10	6.20	573	9.5	1.70	2.30	07/10/07
TW-61	30	6.08	565	9.6	0.71	0.75	07/10/07
TW-62	15	6.48	584	9.2	1.05	5.14	07/10/07

4.6 Rising Head Tests

Rising head tests were completed in the new wells in order to estimate the hydraulic conductivity of the completion interval by displacing water in the well using a bailer and rapidly recording water

levels as they recovered. The rising head tests were conducted in accordance with Golder Technical Procedure TP1.2-17 for Rising Head Slug Test (Golder, 1986).

Each well was bailed and the water level during recovery was monitored using an automated pressure transducer and datalogger. Once the water level re-equilibrated, a second test was performed. The resulting data was processed and analyzed using the Hvorslev method (Hvorslev, 1951) which involves matching a straight-line solution to water-level displacement data collected during the rising head test. The Hvorslev method yields appropriate estimates of hydraulic conductivity. The results of the rising head tests are summarized in Table 3 and the analyses are included in Appendix C.

TABLE 3

Summary of Rising Head Tests

Well Number	Test Number	Hydraulic Conductivity (feet/day)
TW-59	Test 1	8.2
	Test 2	7.9
TW-60	Test 1	5.1
	Test 2	3.5
TW-61	Test 1	87.4
	Test 2	87.4
TW-62	Test 1	35.6
	Test 2	45.8
	Test 3	40.0

Note: Analyzed using Hvorslev method

The range of hydraulic conductivities in the new wells is similar to hydraulic conductivities reported for other wells completed in the UBZ (Golder 1995), which ranged from less than 100 ft/d to over 600 ft/d.

4.7 Groundwater Quality Sampling

Permanent ½-hp submersible pumps and dedicated riser and valve assemblies were installed in each new monitoring well. Groundwater quality sampling was completed in each of the new monitoring wells following the well development and rising head tests to permit an overall evaluation of the downgradient extent of the plume. The groundwater quality samples were collected and analyzed in accordance with procedures outlined in the Quality Assurance Project Plan for the Phase II Remedial Investigation (Golder, 1992) and Golder Technical Procedure TP-1.2-20 Collection of Groundwater Quality Samples (Golder, 1997). Results from the groundwater quality sampling will be included and discussed in the 2007 annual groundwater monitoring report to be submitted in late 2007.

5.0 STRATIGRAPHIC INTERPRETATION

As discussed in previous hydrogeologic investigations at the Monsanto Plant (Golder, 1993; Golder, 1995), five basalt flows are present beneath the site. These flows have been designated Flow I, II, III, IV, and V in ascending order, and are delineated on the basis of changes in lithology or abrupt changes in the natural gamma geophysical log response. The basalt flows consist of slightly weathered to fresh, vesicular basalt. The basalt flows are separated by highly-permeable interbed horizons composed of scoriaceous cinders, silty clay, clayey silt, or sand and gravel. The interbeds have been designated as gamma-1 through gamma-5, in ascending order, with the gamma-1 interbed overlying Basalt Flow I and the gamma-2 interbed overlying Basalt Flow II, and so on.

Data collected from the drilling and geophysical logging activities was used to aid in stratigraphic correlation between the new wells, and between existing wells located north of the new wells and the new wells. As discussed in Section 2 and in previous investigations (Golder, 1992; Golder, 1993; Golder, 1995), the UBZ aquifer consists mainly of the gamma-3 and gamma-4 interbeds. Based on the geophysical logging and stratigraphic interpretation, all the new monitoring wells are completed in the UBZ. Figure 2 shows the location of geologic cross sections described below and the location of wells in the vicinity of the Plant.

Figure 3 shows geologic cross section A-A', a north-south cross section (looking east) from TW-57 to TW-59 (revised from cross section C-C' in Golder, 1993 to show TW-62 and TW-59). No faults are interpreted to exist across this cross section and there is a good correlation between most of the stratigraphic units encountered in the wells shown on Figure 3. Based on correlation of stratigraphic units, TW-59 and TW-62 are completed in the gamma-4 interbed zone.

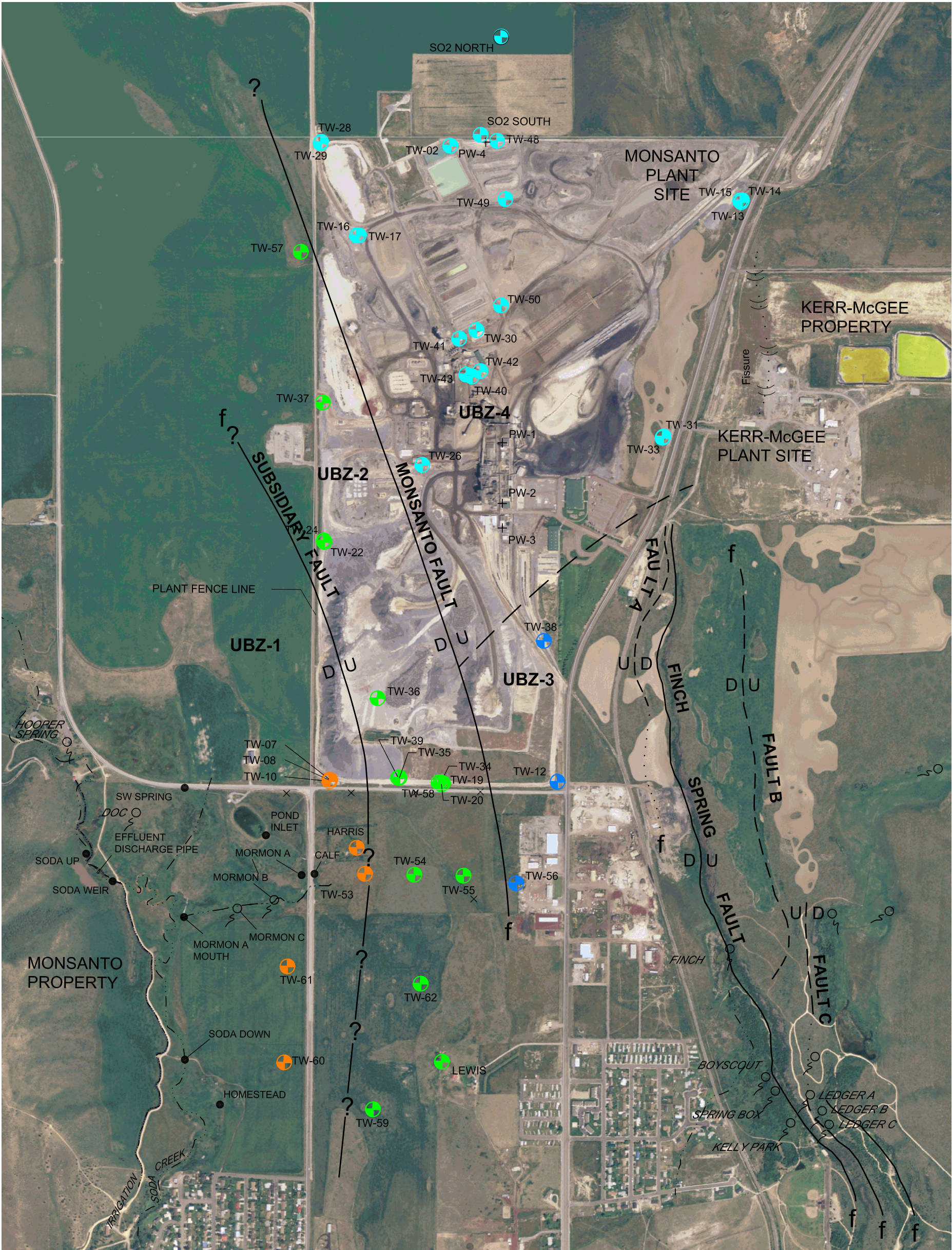
Figure 4 shows geologic cross section B-B', a west-east cross section (looking north) from TW-61 to TW-62. The cross section shows both TW-61 and TW-62 are completed in the gamma-4 interbed. Correlation of stratigraphic units from TW-61 to TW-62 suggest the continuation of the Subsidiary Fault to the south of the Plant boundary. Groundwater quality data (included and discussed in the 2007 annual groundwater monitoring program report, to be submitted in late 2007) suggest that the shallow water-bearing zone that TW-61 is completed in is influenced by upwelling of deeper sodic groundwater. The groundwater quality sample from TW-61 contained elevated concentrations of bicarbonate, manganese, TDS, and calcium, indicative of sodic groundwater influence in this well (Golder, 1995).

Figure 5 shows geologic cross section C-C', a west-east cross section (looking north) from TW-60 to TW-59. Both TW-60 and TW-59 are completed in the UBZ. Correlation of stratigraphic units from TW-60 to TW-59 suggest the continuation of the subsidiary fault to the south to the area of these wells. Groundwater quality data (included and discussed in the 2007 annual groundwater monitoring program report to be submitted in late 2007) suggest that the shallow water-bearing zone TW-60 is completed in is influenced by upwelling of deeper sodic groundwater. The groundwater quality sample from TW-60 had elevated concentrations of bicarbonate, manganese, TDS, and calcium, indicative of sodic groundwater influence in this well (Golder, 1995).

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- Golder Associates Inc., 2007a, 2006 Summary Report, Groundwater Conditions at the Soda Springs Plant, Soda Springs, Idaho, prepared for Monsanto Chemical Company by Golder Associates Inc., Redmond, Washington, dated January 12, 2007.
- Golder Associates Inc., 2007b, Technical Memorandum - Monsanto Soda Springs Plant Geophysical Survey South of Plant Site to Locate New Monitoring Well, prepared for Monsanto Chemical Company by Golder Associates, Inc., Redmond, Washington, dated January 12, 2007.
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- Idaho Administrative Code, 2005, Well Construction Standards Rules (IDAPA 37.03.09), Department of Water Resources, Idaho.

FIGURES



LEGEND

TW-07

Monitoring well location and name in Groundwater Zone UBZ 1

TW-35

Monitoring well location and name in Groundwater Zone UBZ 2

TW-12

Monitoring well location and name in Groundwater Zone UBZ 3

TW-49

Monitoring well location and name in Groundwater Zone UBZ 4

SODA UP

Spring or surface water sample location and name

PW-1

Production well location and name

Spring location and name (where known)

f

Fault (dashed where inferred)

UBZ-1

Groundwater Zones

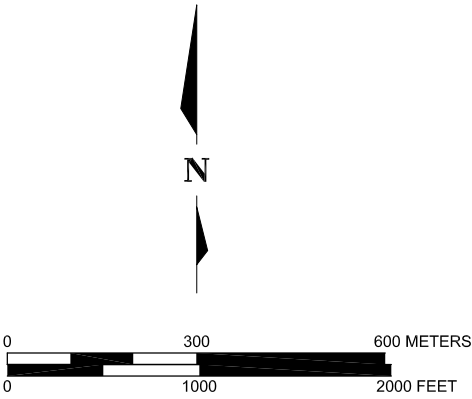
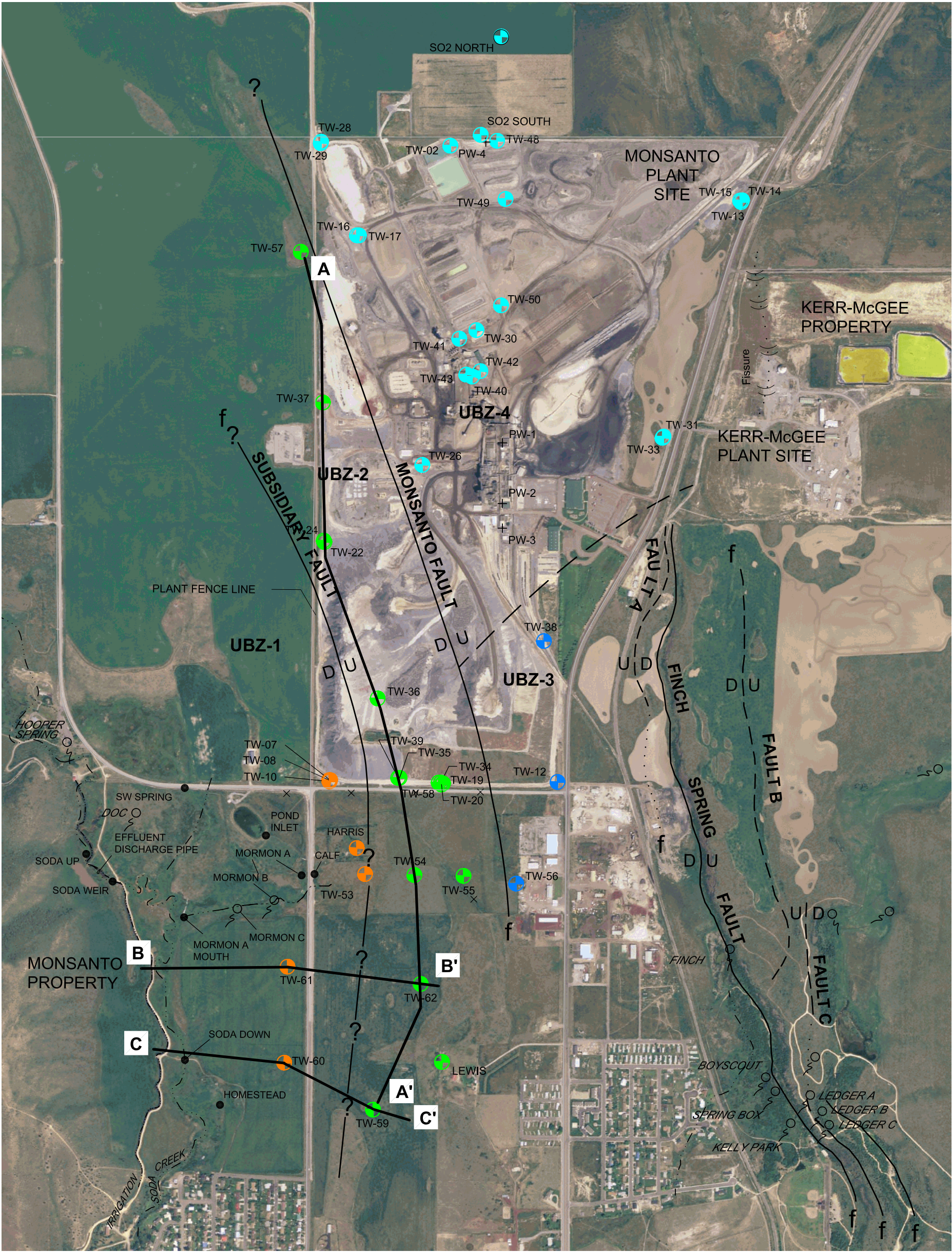


FIGURE 1
LOCATION OF SPRINGS &
WELLS IN UPPER BASALT ZONE
MONSANTO/WELL COMPLETION REPORT/ID



LEGEND

TW-07

TW-35

TW-12

TW-49

SODA UP

PW-1

UBZ-1

A — A'

Monitoring well location and name in Groundwater Zone UBZ 1

Monitoring well location and name in Groundwater Zone UBZ 2

Monitoring well location and name in Groundwater Zone UBZ 3

Monitoring well location and name in Groundwater Zone UBZ 4

Spring or surface water sample location and name

Production well location and name

Spring location and name (where known)

Fault (dashed where inferred)

Groundwater Zones

Geologic Cross Section

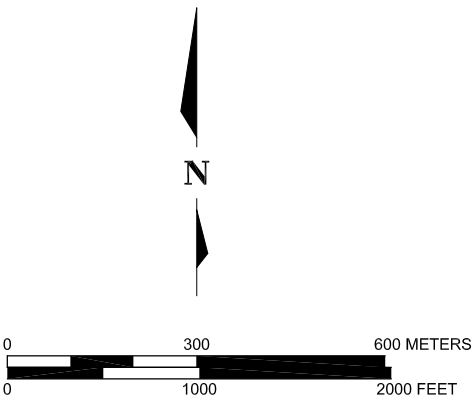
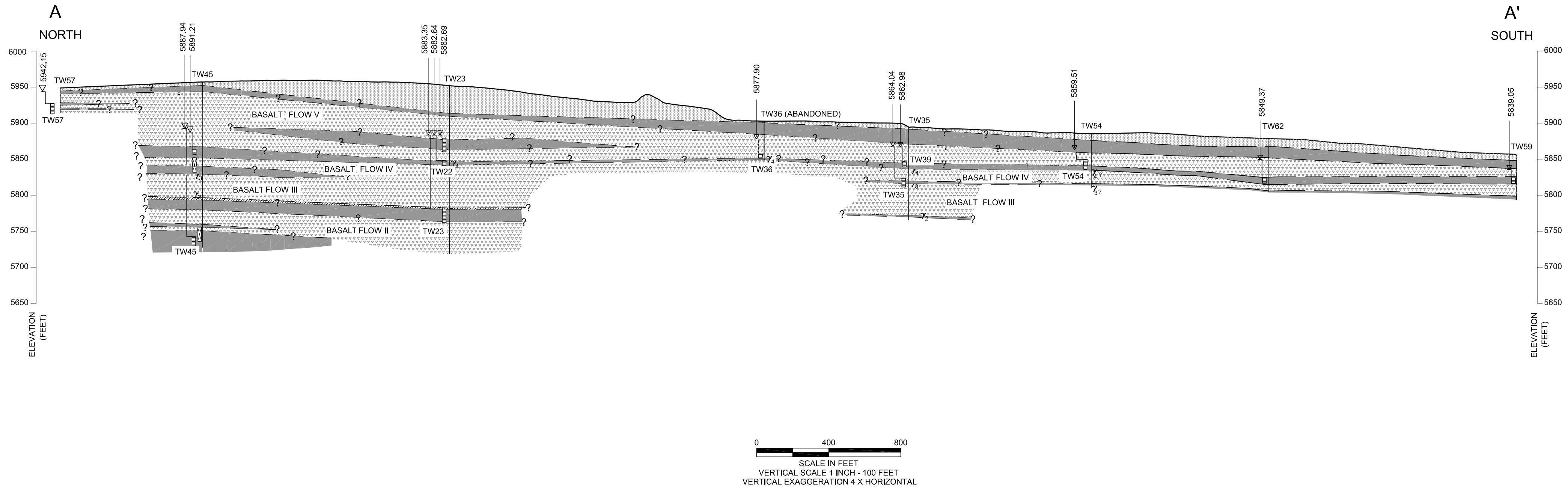


FIGURE 2
LOCATION OF GEOLOGIC
CROSS SECTIONS
MONSANTO/WELL COMPLETION REPORT/ID



NOTE:
GEOLOGIC UNITS WERE INFERRED BASED ON BOREHOLE INFORMATION ONLY. ACTUAL CONDITIONS BETWEEN BOREHOLES MAY DIFFER SIGNIFICANTLY FROM INFORMATION SHOWN ON THIS CROSS SECTION.

LEGEND

5875.3

POTENTIOMETRIC SURFACE AND WATER ELEVATION (FT) (JULY 2007).

LOCATION OF MONITORED ZONE FOR EACH WELL

ABANDONED WELL (TW5 AND TW6)

UNDIFFERENTIATED UNCONSOLIDATED MATERIALS

UNWEATHERED BASALT

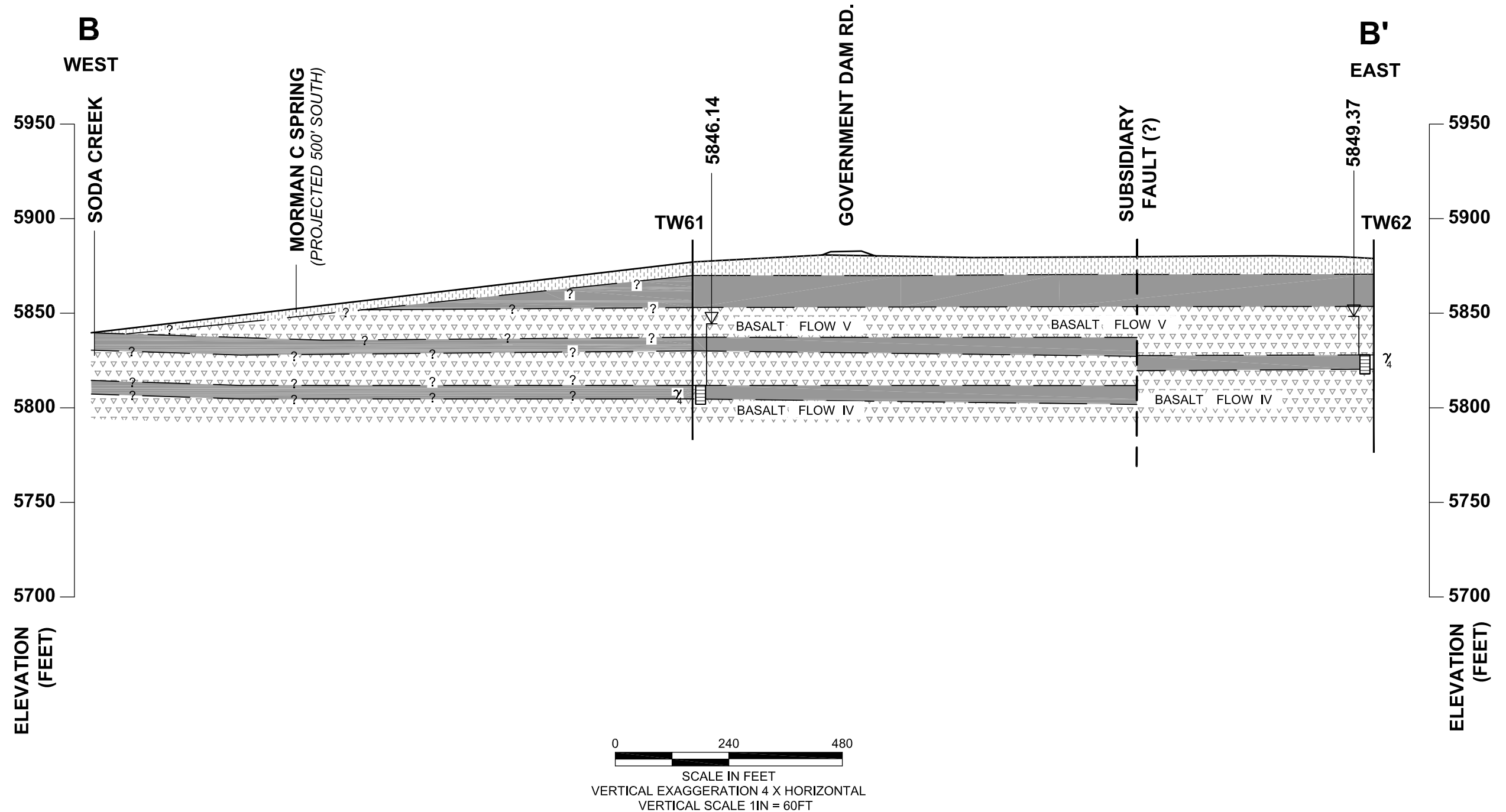
WEATHERED OR FRACTURED BASALT, CINDERS, SANDY SILT, SILTY SAND

CLAY

SAND AND GRAVEL

GAMMA SIGNATURE INDICATING INTERBED HORIZON OVERLYING CORRESPONDING BASALT FLOW

FIGURE 3
GEOLOGIC CROSS - SECTION A-A'
MONSANTO/WELL COMPLETION REPORT/ID



NOTE:
GEOLOGIC UNITS WERE INFERRED BASED ON BOREHOLE INFORMATION ONLY.
ACTUAL CONDITIONS BETWEEN BOREHOLES MAY DIFFER SIGNIFICANTLY FROM
INFORMATION SHOWN ON THIS CROSS SECTION.





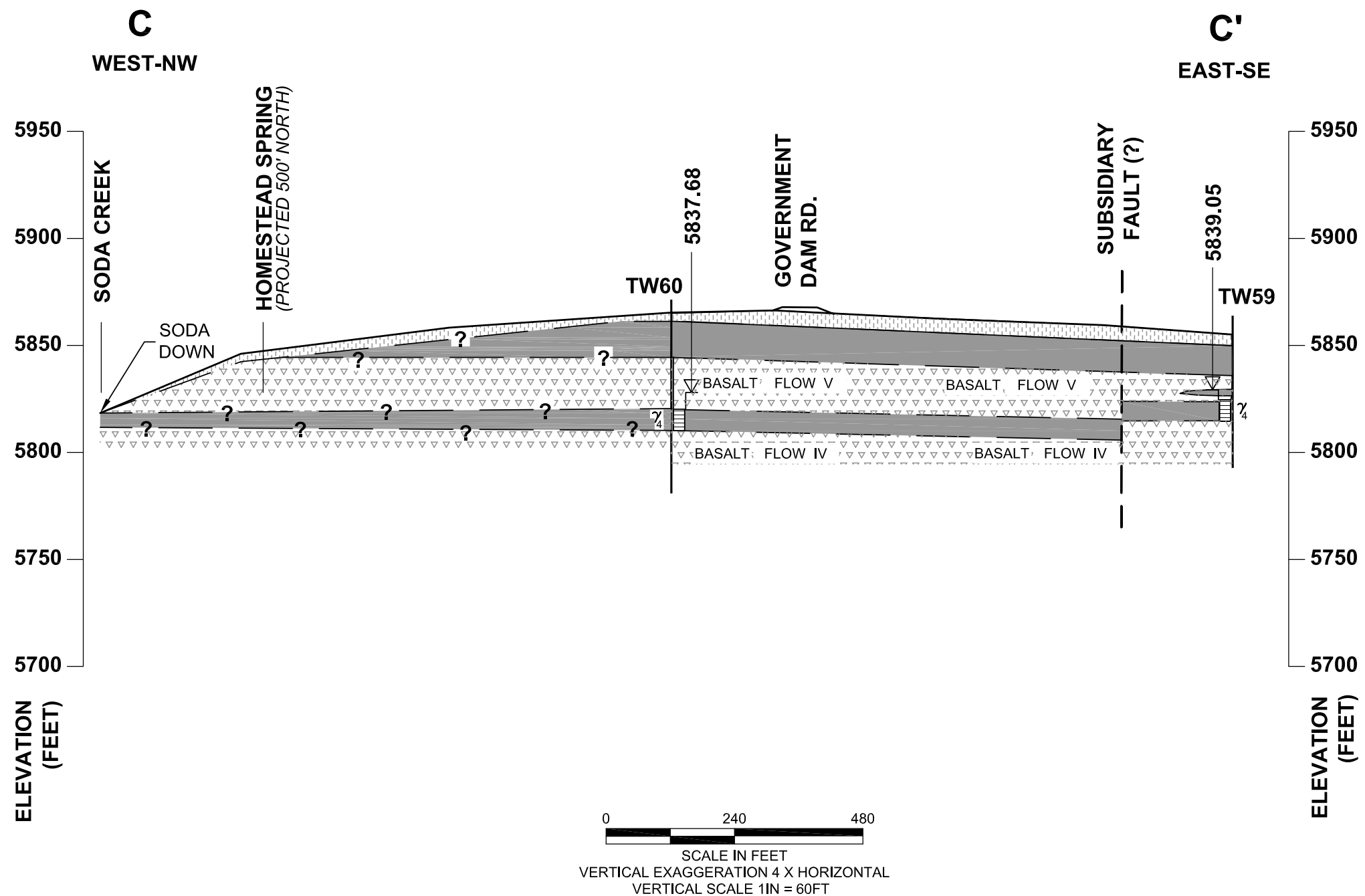
LEGEND			
	POTENTIOMETRIC SURFACE AND WATER ELEVATION (FT) (JULY 2007).		UNDIFFERENTIATED UNCONSOLIDATED MATERIALS
	LOCATION OF MONITORED ZONE FOR EACH WELL		UNWEATHERED BASALT
			WEATHERED OR FRACTURED BASALT, CINDERS, SANDY SILT, SILTY SAND

FIGURE **4**
GEOLOGIC CROSS - SECTION B-B'
MONSANTO/WELL COMPLETION REPORT/ID



NOTE:
GEOLOGIC UNITS WERE INFERRED BASED ON BOREHOLE INFORMATION ONLY.
ACTUAL CONDITIONS BETWEEN BOREHOLES MAY DIFFER SIGNIFICANTLY FROM
INFORMATION SHOWN ON THIS CROSS SECTION.

LEGEND			
	POTENTIOMETRIC SURFACE AND WATER ELEVATION (FT) (JULY 2007).		UNDIFFERENTIATED UNCONSOLIDATED MATERIALS
	LOCATION OF MONITORED ZONE FOR EACH WELL		UNWEATHERED BASALT
			WEATHERED OR FRACTURED BASALT, CINDERS, SANDY SILT, SILTY SAND

FIGURE 5
GEOLOGIC CROSS - SECTION C-C'
MONSANTO/WELL COMPLETION REPORT/ID

APPENDIX A

WELL LOGS AND CONSTRUCTION DIAGRAMS

RECORD OF BOREHOLE TW-59







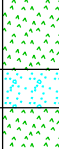


SHEET 1 of 2

PROJECT: Monsanto Soda Springs
PROJECT NUMBER: 913-1101.605
LOCATION: Monsanto Soda Springs

DRILLING METHOD: Air Rotary
DRILLING DATE: 6/27/07
DRILL RIG: Atlas-Copco TH-60

DATUM: MSL
AZIMUTH: N/A
COORDINATES: N: 4,723,978.73 E: 451,577.83

ELEVATION: 5855.89
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					PENETRATION RESISTANCE BLOWS / ft ■				NOTES WATER LEVELS WELL GRAPHIC
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	WATER CONTENT (PERCENT)				
					DEPTH (ft)										
											W _p	W _L	W _u		
0	Air Rotary w/ casing hammer	0.0 - 6.0 Light brownish gray (5YR6/1) to pale yellowish-brown (10YR6/2) Sandy, clayey SILT												0-0.5 feet is cement, below 0.5 feet cement is mixed with bentonite	
5		6.0 - 12.0 Moderate brown (5YR4/4), highly weathered broken BASALT, trace clay			5849.9 6.0										
10		12.0 - 16.0 Dark gray (N3), vesicular, angular, strong BASALT			5843.9 12.0										
15		16.0 - 20.0 Dark gray (N3) sub-rounded to sub-angular, weak, highly weathered broken BASALT			5839.9 16.0	1	GRAB	08:50	08:50	0.5					
20		20.0 - 27.0 Dark gray (N3) moderately weathered, vesicular BASALT			5835.9 20.0	2	GRAB	08:57	08:57	0.5					
25	Air Rotary	27.0 - 28.0 Dark reddish brown (10R3/4) CINDERS mixed with dark gray (N3) broken BASALT			5828.9 27.0									Bentonite seal	
30		28.0 - 33.0 Dark gray (N3) moderately weathered, vesicular BASALT			5827.9 28.0	3	GRAB	09:32 09:38-5	09:32 5	0.5					
35		33.0 - 37.0 Brownish black (5YR2/1) fractured BASALT, with fine sand and few gravels			5822.9 33.0	4	GRAB	09:45-5-10	5-10	0.5					
40		37.0 - 63.0 Dark gray (N3), slightly weathered, vesicular, dense/strong BASALT			5818.9 37.0	5	GRAB	09:50-10-20	10-20	0.5					
			Log continued on next page												

07/06/07

BOREHOLE RECORD GEOPHYSICS BANTON.GPJ GLDR_WA.GDT 11/28/07

1 in to 5 ft
DRILLING CONTRACTOR: Boart Longyear
DRILLER: J. Arfman

LOGGED: P. Fahringer
CHECKED: M. Klisch
DATE: 9/19/2007



RECORD OF BOREHOLE TW-59



SHEET 2 of 2

PROJECT: Monsanto Soda Springs
PROJECT NUMBER: 913-1101.605
LOCATION: Monsanto Soda Springs

DRILLING METHOD: Air Rotary
DRILLING DATE: 6/27/07
DRILL RIG: Atlas-Copco TH-60

DATUM: MSL
AZIMUTH: N/A
COORDINATES: N: 4,723,978.73 E: 451,577.83

ELEVATION: 5855.89
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					PENETRATION RESISTANCE BLOWS / ft ■					NOTES WATER LEVELS WELL GRAPHIC			
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	WATER CONTENT (PERCENT)								
					DEPTH (ft)						W_p ——— W ——— W_L								
40	Air Rotary	37.0 - 63.0 Dark gray (N3), slightly weathered, vesicular, dense/strong BASALT (Continued)				6	GRAB	09:56-15-25	15-25	0.5									
45						7	GRAB	10:07-10-20	10-20	0.5									
50						8	GRAB	10:14-10-20	10-20	0.5									
55						9	GRAB	10:18-15-25	15-25	0.5									
60						10	GRAB	10:21-10-20	10-20	0.5									
					5792.9 63.0	11	GRAB	10:29-10-20	10-20	0.5									
65		Boring completed at 63.0 ft.																	
70																			
75																			
80																			

BOREHOLE RECORD GEOPHYSICS, BANTON.GPJ GLDR_WA.GDT 11/28/07

1 in to 5 ft
DRILLING CONTRACTOR: Boart Longyear
DRILLER: J. Arfman

LOGGED: P. Fahringer
CHECKED: M. Klisch
DATE: 9/19/2007



RECORD OF BOREHOLE TW-60

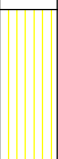






SHEET 1 of 2

PROJECT: Monsanto Soda Springs
PROJECT NUMBER: 913-1101.605
LOCATION: Monsanto Soda Springs

DRILLING METHOD: Air Rotary
DRILLING DATE: 6/28/07-6/30/07
DRILL RIG: Atlas-Copco TH-60

DATUM: MSL
AZIMUTH: N/A
COORDINATES: N: 4,724,123.90 E: 451,303.03

ELEVATION: 5866.98
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					PENETRATION RESISTANCE BLOWS / ft ■					NOTES WATER LEVELS WELL GRAPHIC
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	WATER CONTENT (PERCENT)					
					DEPTH (ft)						W _p ———— W _L					
0	Air Rotary w/ casing hammer	0.0 - 4.0 Pale brown (5YR5/2) clayey, sandy SILT			5863.0											
				4.0												
5		4.0 - 11.5 Highly weathered, fractured, broken, vesicular, weak BASALT														
				5855.5												
			11.5 - 15.0 Light brownish gray (5YR6/1), very weak, sandy, clayey SILT with some to many dark gray (N3) and grayish red (10R4/2) basalt CINDERS			11.5	1	GRAB	13:20	13:20	0.5					
15		15.0 - 19.0 Dark gray (N3), highly weathered, fractured, broken, vesicular, weak BASALT			5852.0	2	GRAB	13:25	13:25	0.5						
				15.0												
				5848.0												
			19.0 - 20.5 Grayish red (10R4/2) CINDER zone			19.0										
20				5846.5		3	GRAB	13:55	13:55	0.5						
	Air Rotary	20.5 - 30.0 Dark gray (N3), slightly weathered, slightly fractured, strong BASALT			5846.5											
				20.5												
25						4	GRAB	14:18	14:18	0.5						
				5837.0												
30		30.0 - 40.0 grades to Grayish black (N2), fresh BASALT			30.0	5	GRAB	14:35-<5	<5	0.5						
35						6	GRAB	14:46-<5	<5	0.5						
40					5827.0											
		Log continued on next page														

Bentonite grout

Steel centralizer

Bentonite pellet seal

07/06/07

BOREHOLE RECORD GEOPHYSICS, BANTON.GPJ GLDR_WA.GDT 11/28/07

1 in to 5 ft
DRILLING CONTRACTOR: Boart Longyear
DRILLER: J. Arfman

LOGGED: P. Fahringer
CHECKED: M. Klich
DATE: 9/19/2007



RECORD OF BOREHOLE TW-60

SHEET 2 of 2


PROJECT: Monsanto Soda Springs
PROJECT NUMBER: 913-1101.605
LOCATION: Monsanto Soda Springs

DRILLING METHOD: Air Rotary
DRILLING DATE: 6/28/07-6/30/07
DRILL RIG: Atlas-Copco TH-60

DATUM: MSL
AZIMUTH: N/A
COORDINATES: N: 4,724,123.90 E: 451,303.03

ELEVATION: 5866.98
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					PENETRATION RESISTANCE BLOWS / ft ■					NOTES WATER LEVELS WELL GRAPHIC
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	WATER CONTENT (PERCENT)					
					DEPTH (ft)						10	20	30	40		

40	Air Rotary	40.0 - 50.0 Grayish black (N2) dense, strong, fresh BASALT			40.0	7	GRAB	14:53-0	0	0.5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								</
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Steel
centralizer

Colorado
10/20 silica
sand

Slotted PVC
(0.020 inch
openings)

Steel
centralizer
Cap

Bentonite/cement
grout (6 bags
of hole plug
plus one
bucket of
pellet seal)

BOREHOLE RECORD GEOPHYSICS BANTON.GPJ GLDR_WA.GDT 11/28/07

1 in to 5 ft
DRILLING CONTRACTOR: Boart Longyear
DRILLER: J. Arfman

LOGGED: P. Fahringer
CHECKED: M. Klisch
DATE: 9/19/2007



RECORD OF BOREHOLE TW-61





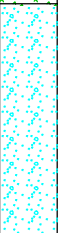


SHEET 1 of 3

PROJECT: Monsanto Soda Springs
PROJECT NUMBER: 913-1101.605
LOCATION: Monsanto Soda Springs

DRILLING METHOD: Air Rotary
DRILLING DATE: 6/30/07-7/02/07
DRILL RIG: Atlas-Copco TH-60

DATUM: MSL
AZIMUTH: N/A
COORDINATES: N: 4,724,421.92 E: 451,313.11

ELEVATION: 5876.17
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					PENETRATION RESISTANCE BLOWS / ft ■					NOTES WATER LEVELS WELL GRAPHIC
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	WATER CONTENT (PERCENT)					
					DEPTH (ft)						W _p ——— W _L					
											10	20	30	40		
0	Air Rotary w/ casing hammer	0.0 - 1.5 Dark brown, moist, silty LOAM			5874.7											
		1.5 - 6.0 Light brownish gray (5YR6/1) sandy clayey SILT, few basalt pieces in cuttings			1.5											
5					5870.2											
		6.0 - 15.0 Moderate brown (5YR4/4) highly weathered, broken BASALT, trace sand, trace clay			6.0											
10						1	GRAB	15:54	15:54	0.5						
					5861.2											
15		15.0 - 18.0 Slightly less weathered BASALT			15.0	2	GRAB	15:59	15:59	0.5						
					5858.2											
20		18.0 - 24.0 Reddish brown basalt CINDERS			18.0	3	GRAB	16:05	16:05	0.5						
					5852.2											
25	Air Rotary	24.0 - 30.0 Dark gray (N3) moderately fractured, weak, vesicular, angular to sub-angular fresh BASALT			24.0	5	GRAB	16:40	16:40	0.5						
					5846.2											
30		30.0 - 40.0 Dark gray (N3), slightly weathered to fresh strong BASALT			30.0	6	GRAB	08:20	08:20	0.5						
35						7	GRAB	08:30	08:30	0.5						
40		Log continued on next page			5836.2										Steel	

Bentonite Grout

07/06/07

BOREHOLE RECORD GEOPHYSICS BANTON.GPJ GLDR_WA.GDT 11/28/07

1 in to 5 ft
DRILLING CONTRACTOR: Boart Longyear
DRILLER: J. Arfman

LOGGED: P. Fahringer
CHECKED: M. Klisch
DATE: 9/19/2007



SHEET 2 of 3

ELEVATION: 5876.17
INCLINATION: -90

BOREHOLE RECORD GEOPHYSICS_BANTON.GPJ GLDR_WA_GDT 11/28/07

**Golder
Associates**

RECORD OF BOREHOLE TW-61



SHEET 3 of 3

PROJECT: Monsanto Soda Springs
PROJECT NUMBER: 913-1101.605
LOCATION: Monsanto Soda Springs

DRILLING METHOD: Air Rotary
DRILLING DATE: 6/30/07-7/02/07
DRILL RIG: Atlas-Copco TH-60

DATUM: MSL
AZIMUTH: N/A
COORDINATES: N: 4,724,421.92 E: 451,313.11

ELEVATION: 5876.17
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				PENETRATION RESISTANCE BLOWS / ft ■				NOTES WATER LEVELS WELL GRAPHIC	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	10 20 30 40				
					DEPTH (ft)						WATER CONTENT (PERCENT)				
											W _p ———— W _L				
80					5795.2 81.0	16	GRAB	10:25->15	>15	0.5					
		Boring completed at 80.0 ft.													
85															
90															
95															
100															
105															
110															
115															
120															

BOREHOLE RECORD GEOPHYSICS_BANTON.GPJ GLDR_WA.GDT 11/28/07

1 in to 5 ft
DRILLING CONTRACTOR: Boart Longyear
DRILLER: J. Arfman

LOGGED: P. Fahringer
CHECKED: M. Klisch
DATE: 9/19/2007



RECORD OF BOREHOLE TW-62

SHEET 1 of 2

PROJECT: Monsanto Soda Springs
PROJECT NUMBER: 913-1101.605
LOCATION: Monsanto Soda Springs

DRILLING METHOD: Air Rotary
DRILLING DATE: 7/7/07
DRILL RIG: Atlas-Copco TH-60

DATUM: MSL
AZIMUTH: N/A
COORDINATES: N: 4,724,367.56 E: 451,725.47

ELEVATION: 5878.67
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				PENETRATION RESISTANCE BLOWS / ft ■				NOTES WATER LEVELS WELL GRAPHIC	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	WATER CONTENT (PERCENT)				
					DEPTH (ft)						W _p ———— W _L				
											10	20	30		40
0	Air Rotary w/ casing hammer	0.0 - 5.0 Loose, dark yellowish brown (10YR4/2) SILT, trace to little fine sand													
5		5.0 - 10.0 Increasing BASALT fragments			5873.7 5.0	1	GRAB	10:24	10:24	0.5					
10		10.0 - 13.0 Grayish black (N2) to dark yellowish brown (10YR4/2), weathered, fine-grained BASALT with little silt and sand.			5868.7 10.0	2	GRAB	10:27	10:27	0.5					
15		13.0 - 20.0 Grayish black (N2) fine-grained BASALT, moderately fractured			5865.7 13.0	3	GRAB	10:29	10:29	0.5					
20	Air Rotary	20.0 - 27.5 Weathered, dark reddish brown (10R3/4) to blackish red (5R2/2) fine-grained BASALT, trace silt			5858.7 20.0	4	GRAB	10:31	10:31	0.5				Cement grout with bentonite	
25						5	GRAB	10:54	10:54	0.5				Steel centralizer	
30		27.5 - 48.0 Fresh to slightly weathered, unfractured moderate dark gray (N3) to grayish black (N2) BASALT			5851.2 27.5	6	GRAB	11:12	11:12	0.5					
35						7	GRAB	11:20	11:20	0.5					
40		Log continued on next page													

BOREHOLE RECORD GEOPHYSICS, BANTON.GPJ GLDR_WA.GDT 11/28/07

1 in to 5 ft
DRILLING CONTRACTOR: Boart Longyear
DRILLER: J. Arfman

LOGGED: M. Klisch
CHECKED: J. Pietraszek
DATE: 9/19/2007



RECORD OF BOREHOLE TW-62

SHEET 2 of 2


PROJECT: Monsanto Soda Springs
PROJECT NUMBER: 913-1101.605
LOCATION: Monsanto Soda Springs

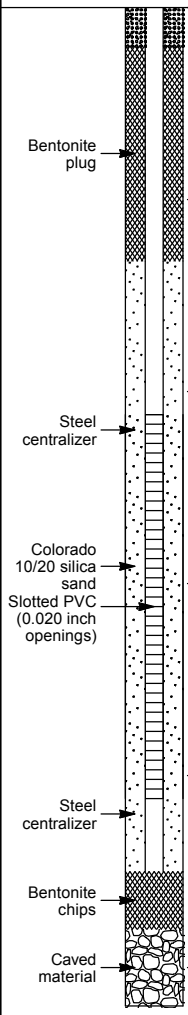
DRILLING METHOD: Air Rotary
DRILLING DATE: 7/7/07
DRILL RIG: Atlas-Copco TH-60

DATUM: MSL
AZIMUTH: N/A
COORDINATES: N: 4,724,367.56 E: 451,725.47

ELEVATION: 5878.67
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					PENETRATION RESISTANCE BLOWS / ft ■					NOTES WATER LEVELS WELL GRAPHIC
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	WATER CONTENT (PERCENT)					
					DEPTH (ft)						10	20	30	40		

40	Air Rotary	27.5 - 48.0 Fresh to slightly weathered, unfractured moderate dark gray (N3) to grayish black (N2) BASALT (Continued)				8	GRAB	11:30	11:30	0.5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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BOREHOLE RECORD GEOPHYSICS.BANTON.GPJ GLDR_WA.GDT 11/28/07

1 in to 5 ft
DRILLING CONTRACTOR: Boart Longyear
DRILLER: J. Arfman

LOGGED: M. Klisch
CHECKED: J. Pietraszek
DATE: 9/19/2007



APPENDIX B

GEOPHYSICAL WELL LOGS

GEOPHYSICAL RECORD OF BOREHOLE TW-59

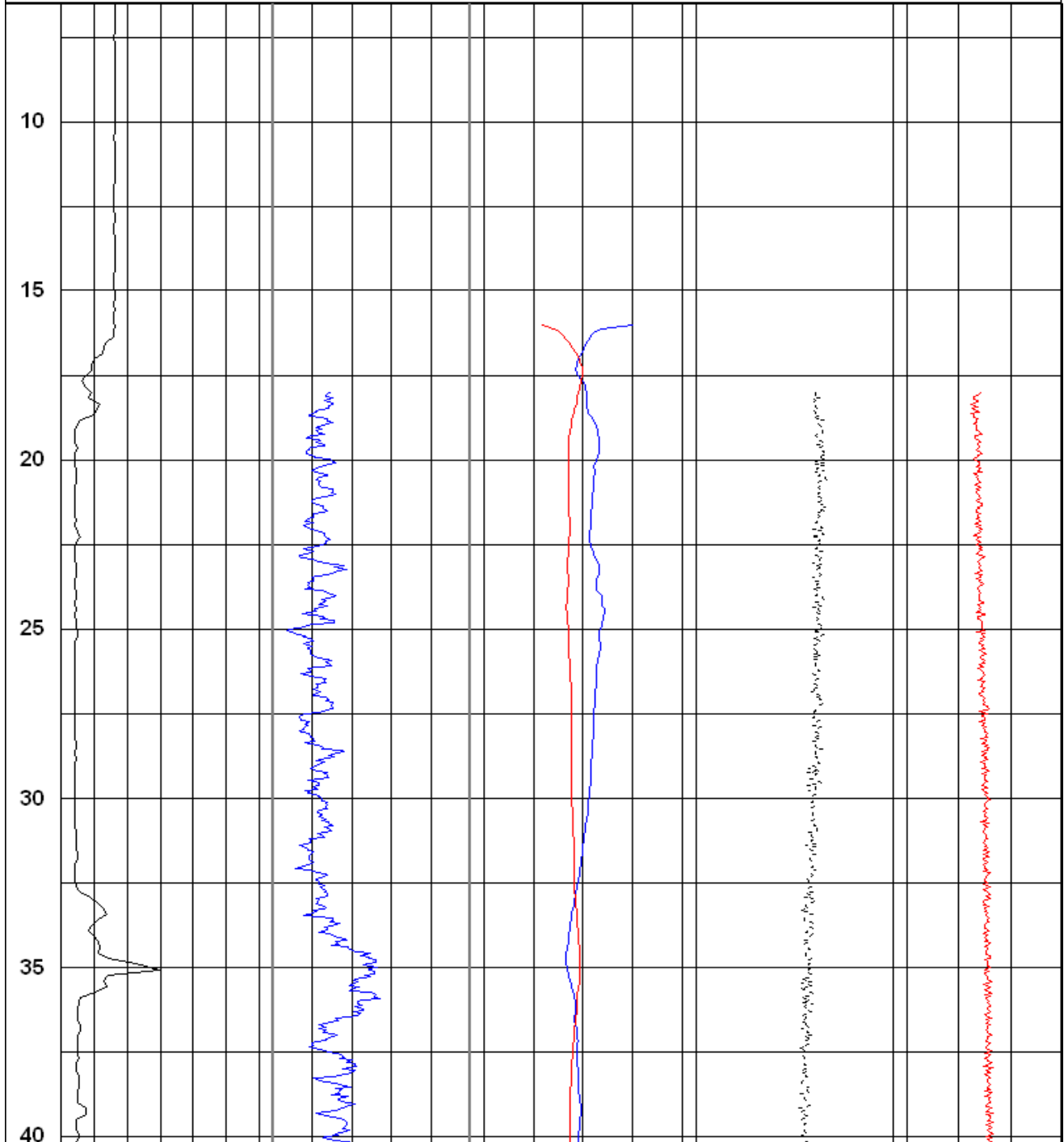
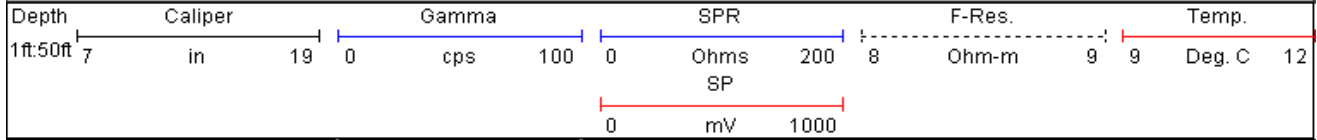
PROJECT REF. 913-1101.605

LOCATION Monsanto Soda Springs



LOG DATE June 27, 2007

LOG REF. Ground Surface



GEOPHYSICAL RECORD OF BOREHOLE TW-59

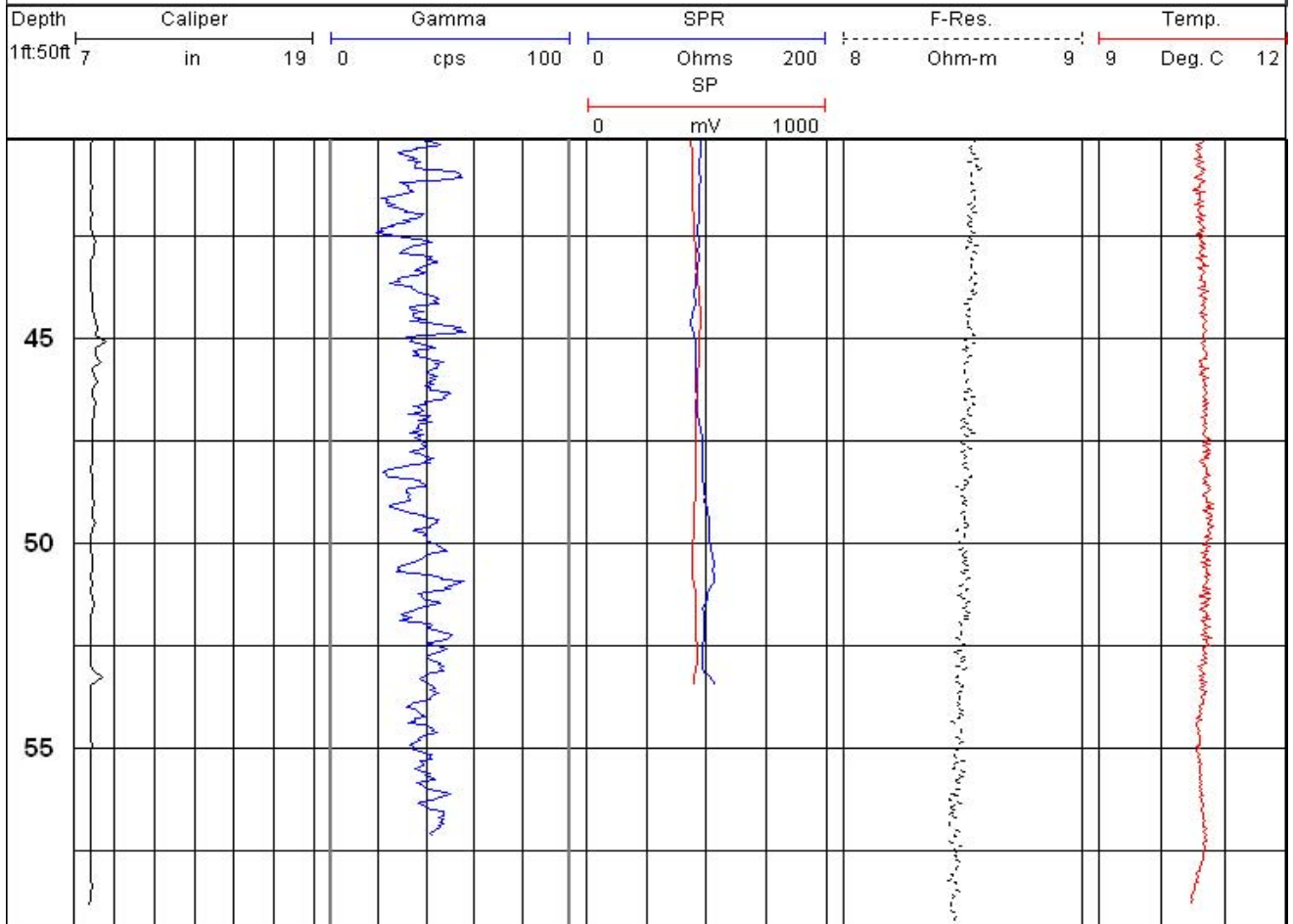
PROJECT REF. 913-1101.605

LOCATION Monsanto Soda Springs



LOG DATE June 27, 2007

LOG REF. Ground Surface



GEOPHYSICAL RECORD OF BOREHOLE TW-60

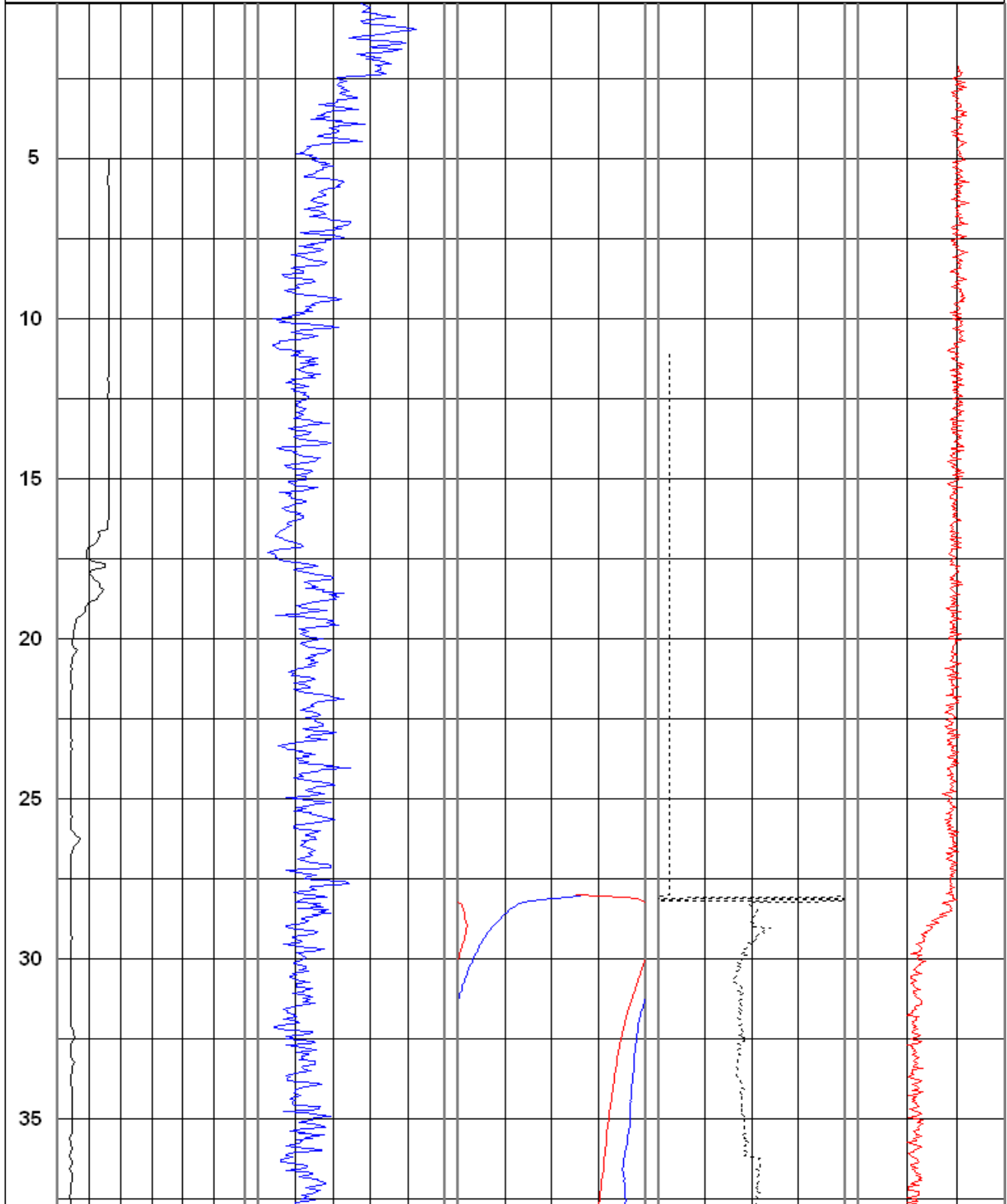
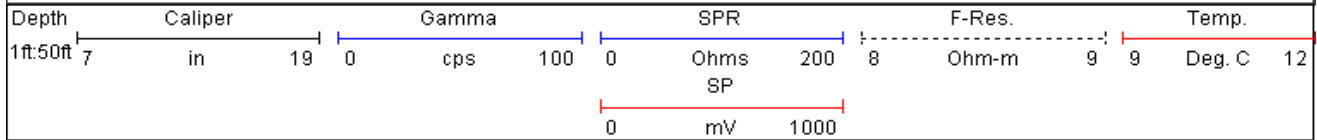
PROJECT REF. 913-1101.605

LOCATION Monsanto Soda Springs



LOG DATE June 29, 2007

LOG REF. Ground Surface



GEOPHYSICAL RECORD OF BOREHOLE TW-60

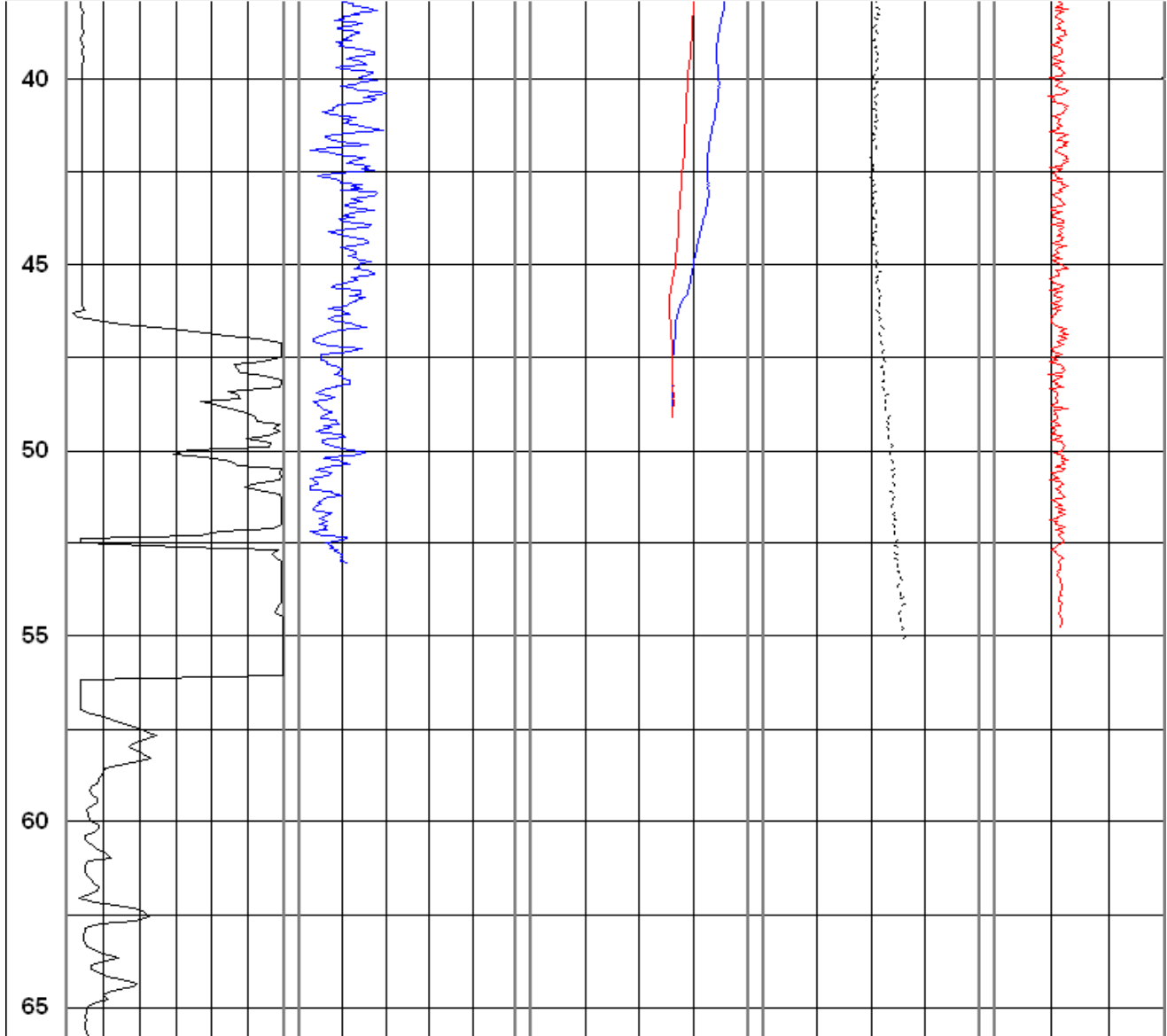
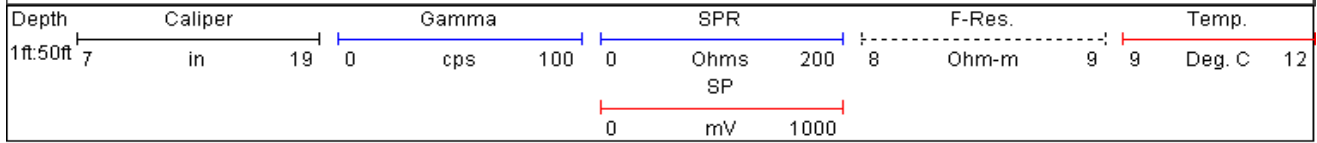
PROJECT REF. 913-1101.605

LOCATION Monsanto Soda Springs



LOG DATE June 29, 2007

LOG REF. Ground Surface



GEOPHYSICAL RECORD OF BOREHOLE TW-61

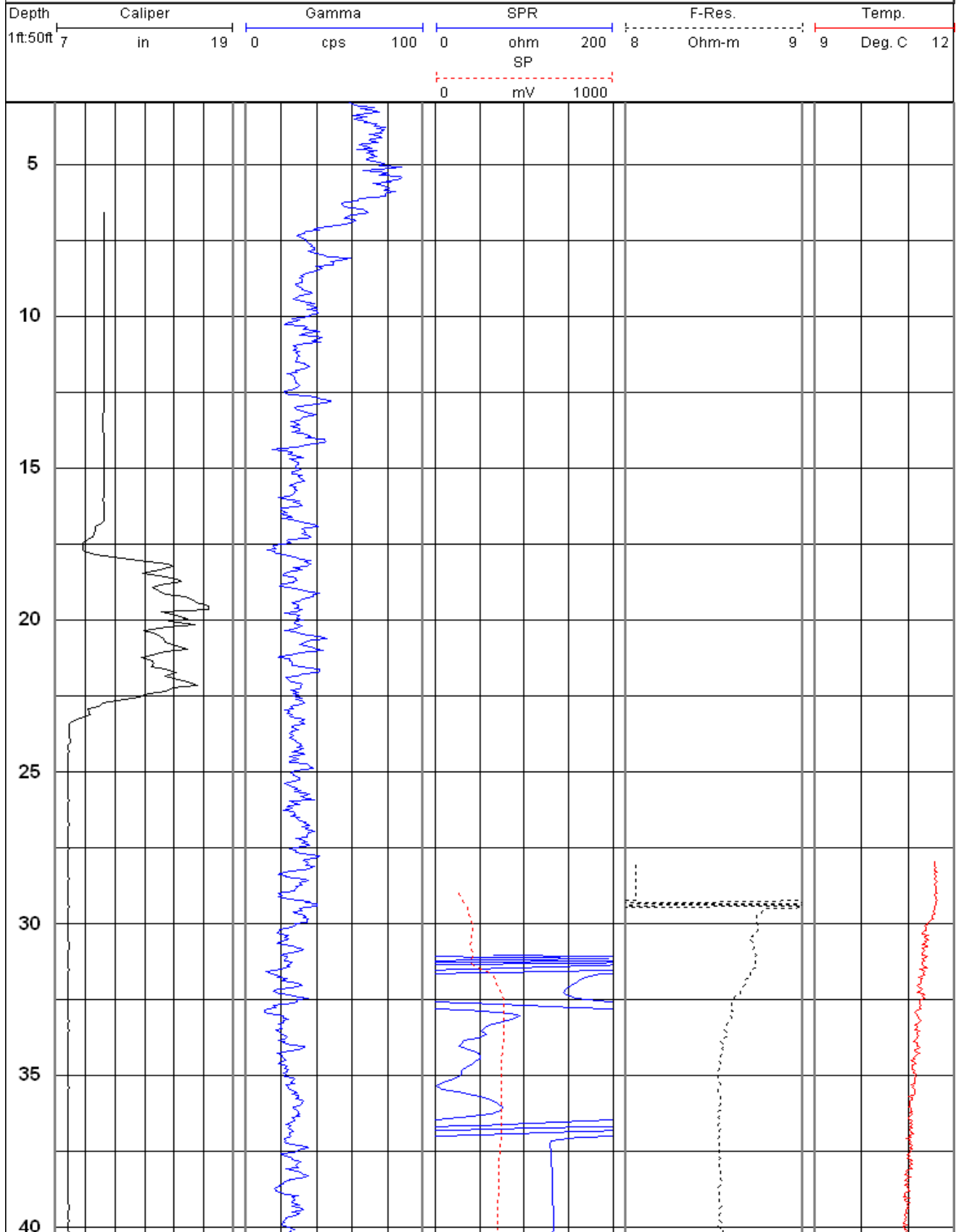
PROJECT REF. 913-1101.605

LOCATION Monsanto Soda Springs



LOG DATE July 1, 2007

LOG REF. Ground Surface



GEOPHYSICAL RECORD OF BOREHOLE TW-61

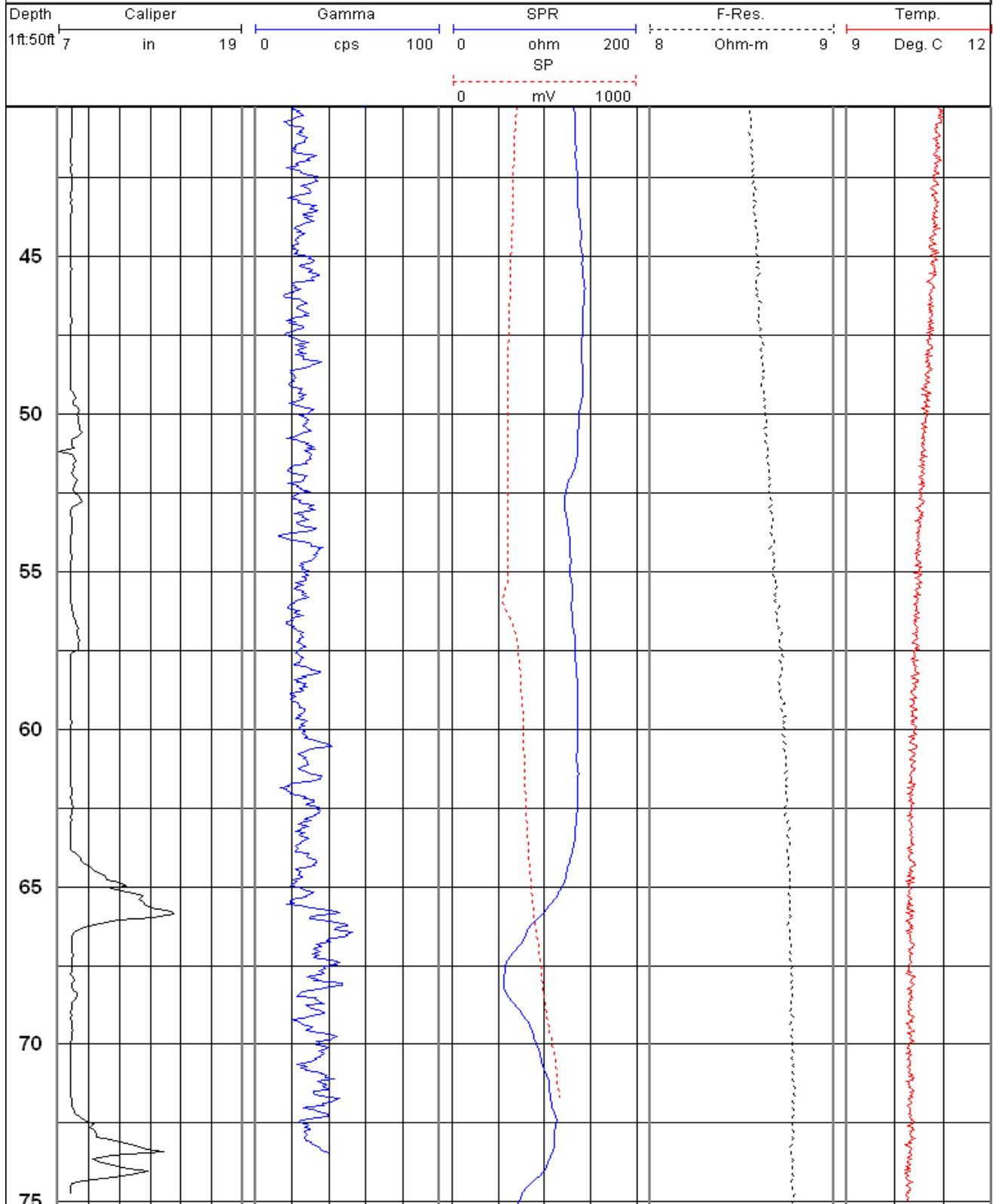
PROJECT REF. 913-1101.605

LOCATION Monsanto Soda Springs



LOG DATE July 1, 2007

LOG REF. Ground Surface



GEOPHYSICAL RECORD OF BOREHOLE TW-62

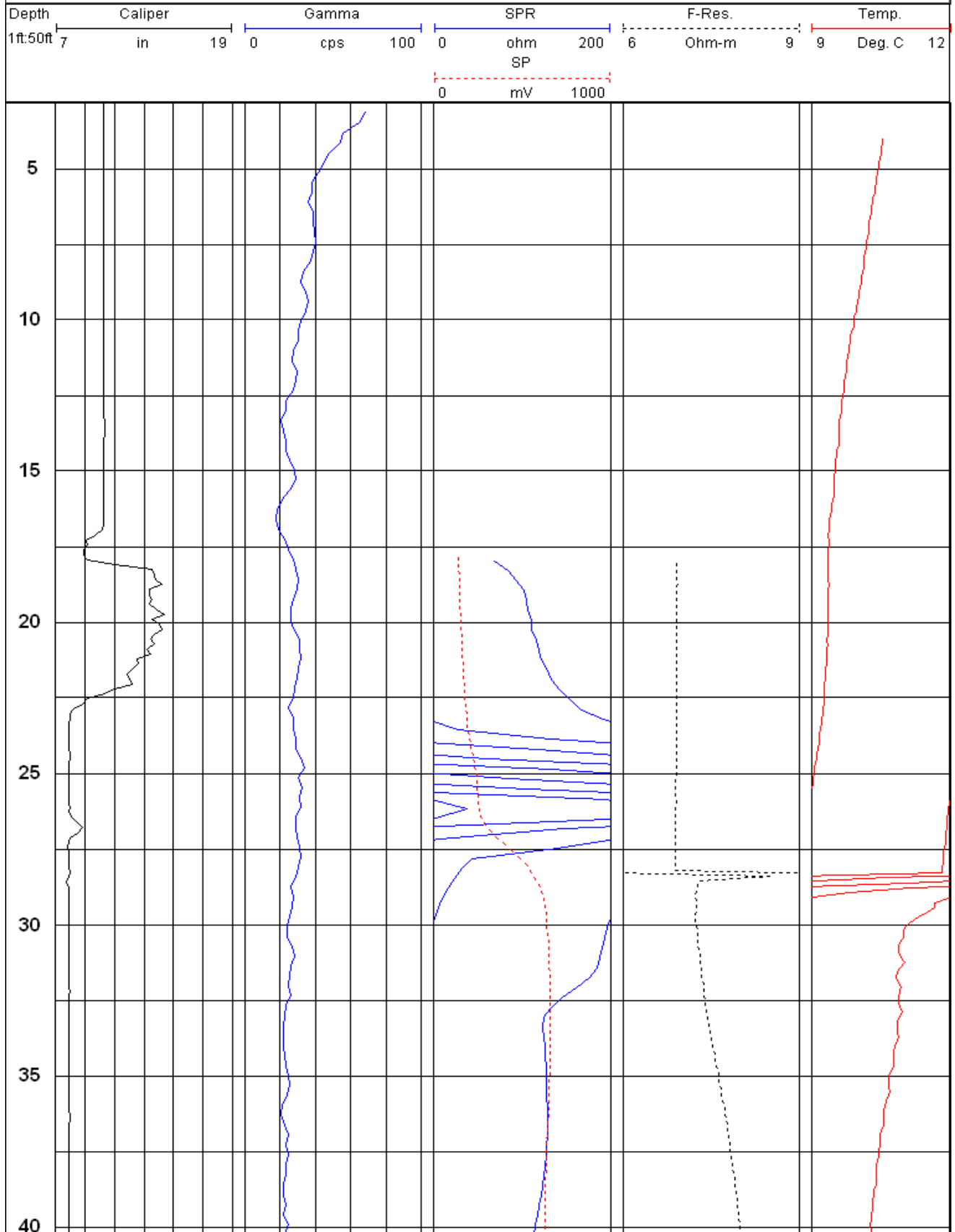
PROJECT REF. 913-1101.605

LOCATION Monsanto Soda Springs



LOG DATE July 7, 2007

LOG REF. Ground Surface



GEOPHYSICAL RECORD OF BOREHOLE TW-62

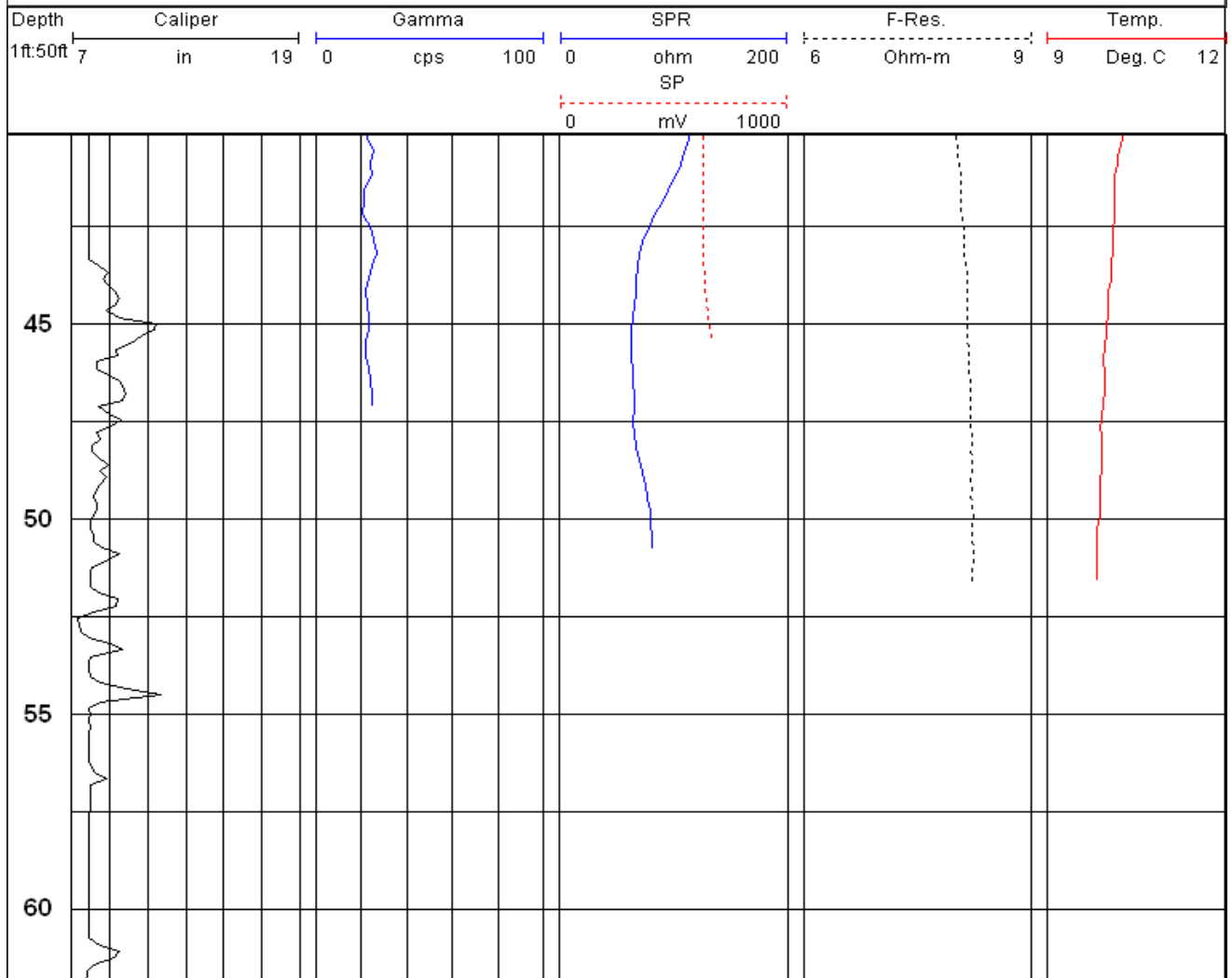
PROJECT REF. 913-1101.605

LOCATION Monsanto Soda Springs



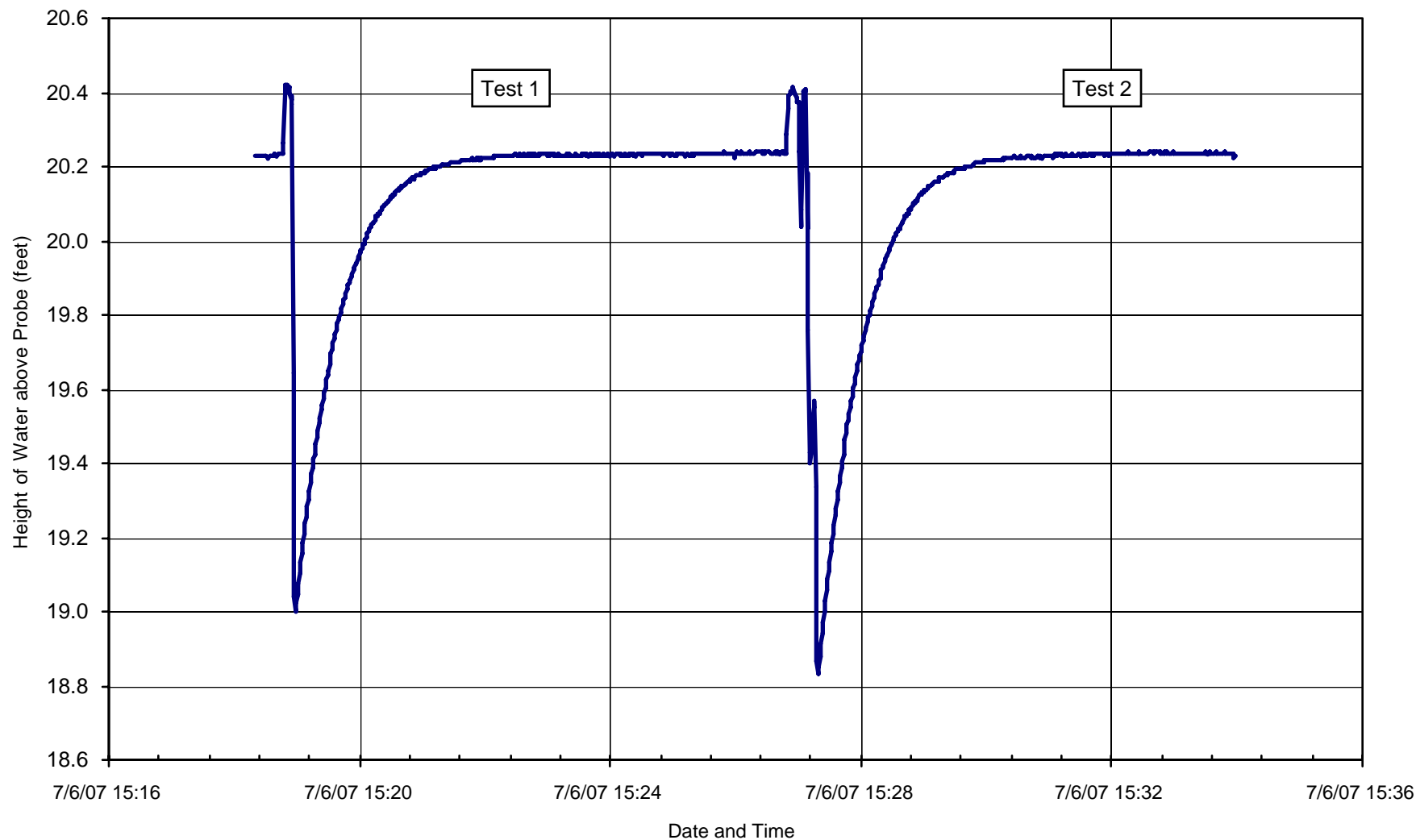
LOG DATE July 7, 2007

LOG REF. Ground Surface



APPENDIX C

RISING HEAD TEST RESULTS



Monsanto/New Monitoring Wells/ID

TITLE

TW-59 Rising Head Test Hydrograph

DRAWN MPK

DATE Oct-07

JOB NO. 913-1101.605

CHECKED DB

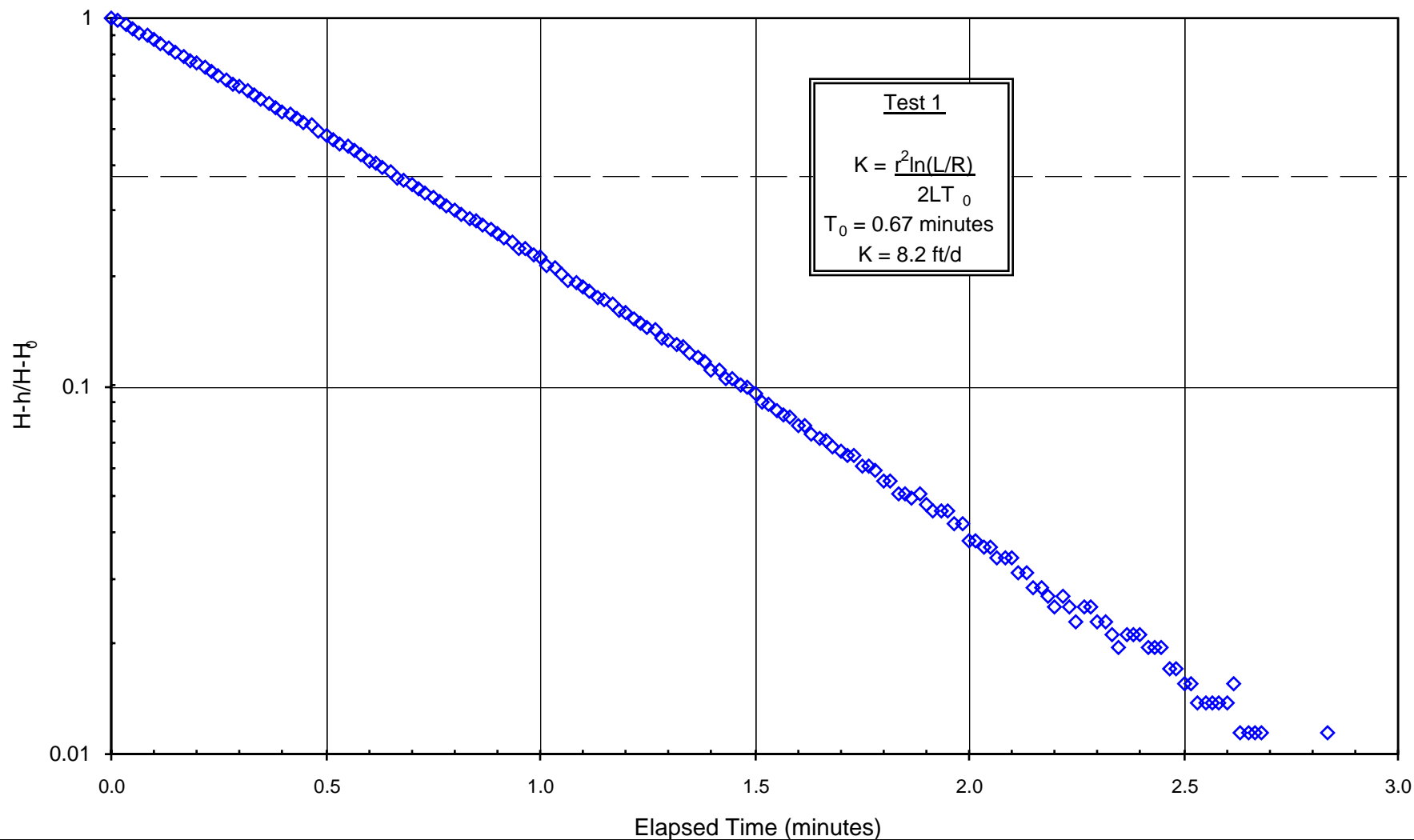
SCALE na

DWG. NO. na

REVIEWED DB

FILE NO. TW59 RHT.xls

FIGURE NO. C-1



Monsanto/New Monitoring Wells/ID

TITLE

TW-59 Test 1 Analysis

DRAWN MPK

DATE Oct-07

JOB NO. 913-1101.605

CHECKED DB

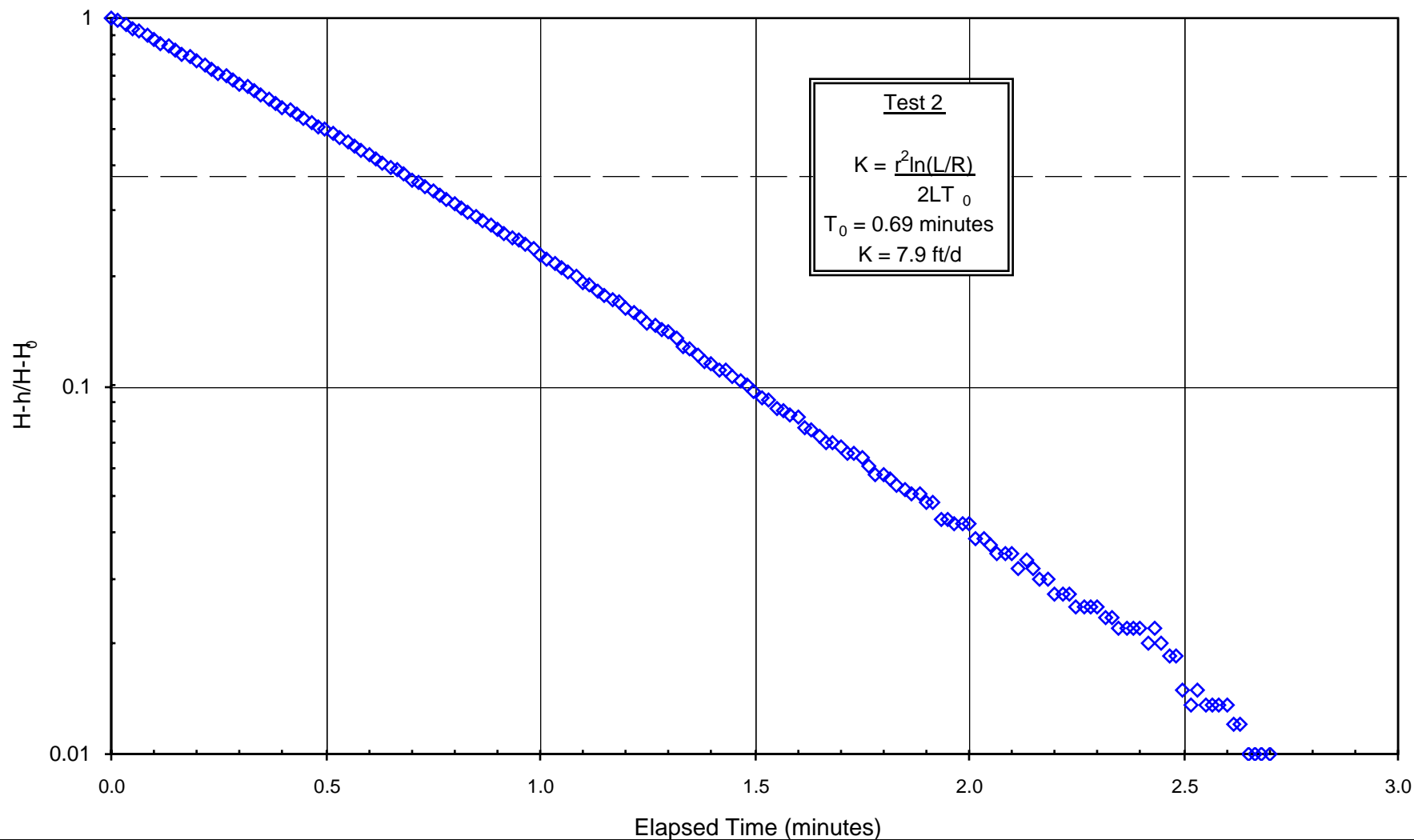
SCALE na

DWG. NO. na

REVIEWED DB

FILE NO. TW59 RHT.xls

FIGURE NO. C-2



Monsanto/New Monitoring Wells/ID

TITLE

TW-59 Test 2 Analysis

DRAWN MPK

DATE Oct-07

JOB NO. 913-1101.605

CHECKED DB

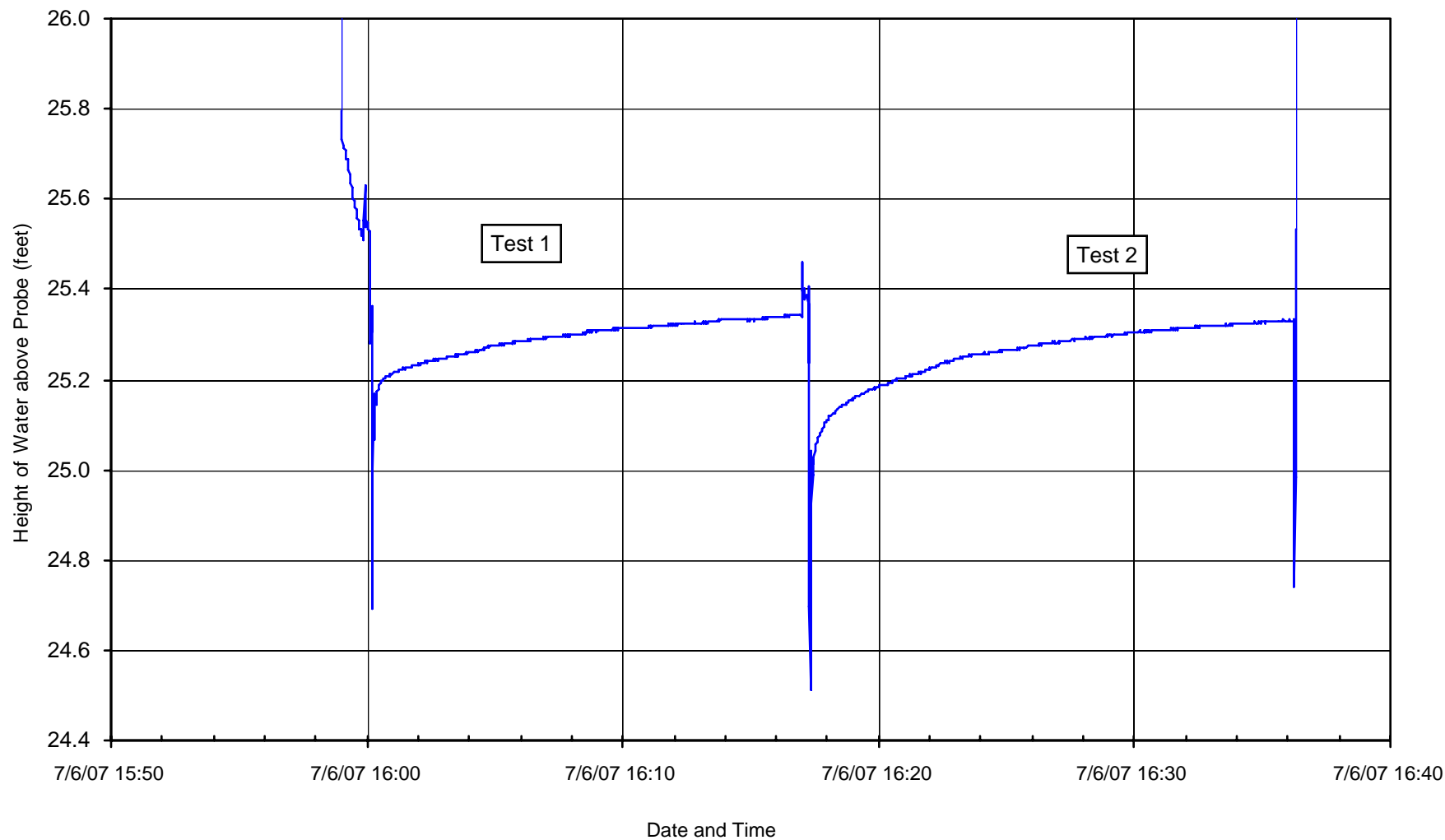
SCALE na

DWG. NO. na

REVIEWED DB

FILE NO. TW59 RHT.xls

FIGURE NO. **C-3**



Monsanto/New Monitoring Wells/ID

TITLE

TW-60 Rising Head Test Hydrograph

DRAWN MPK

DATE Oct-07

JOB NO. 913-1101.605

CHECKED DB

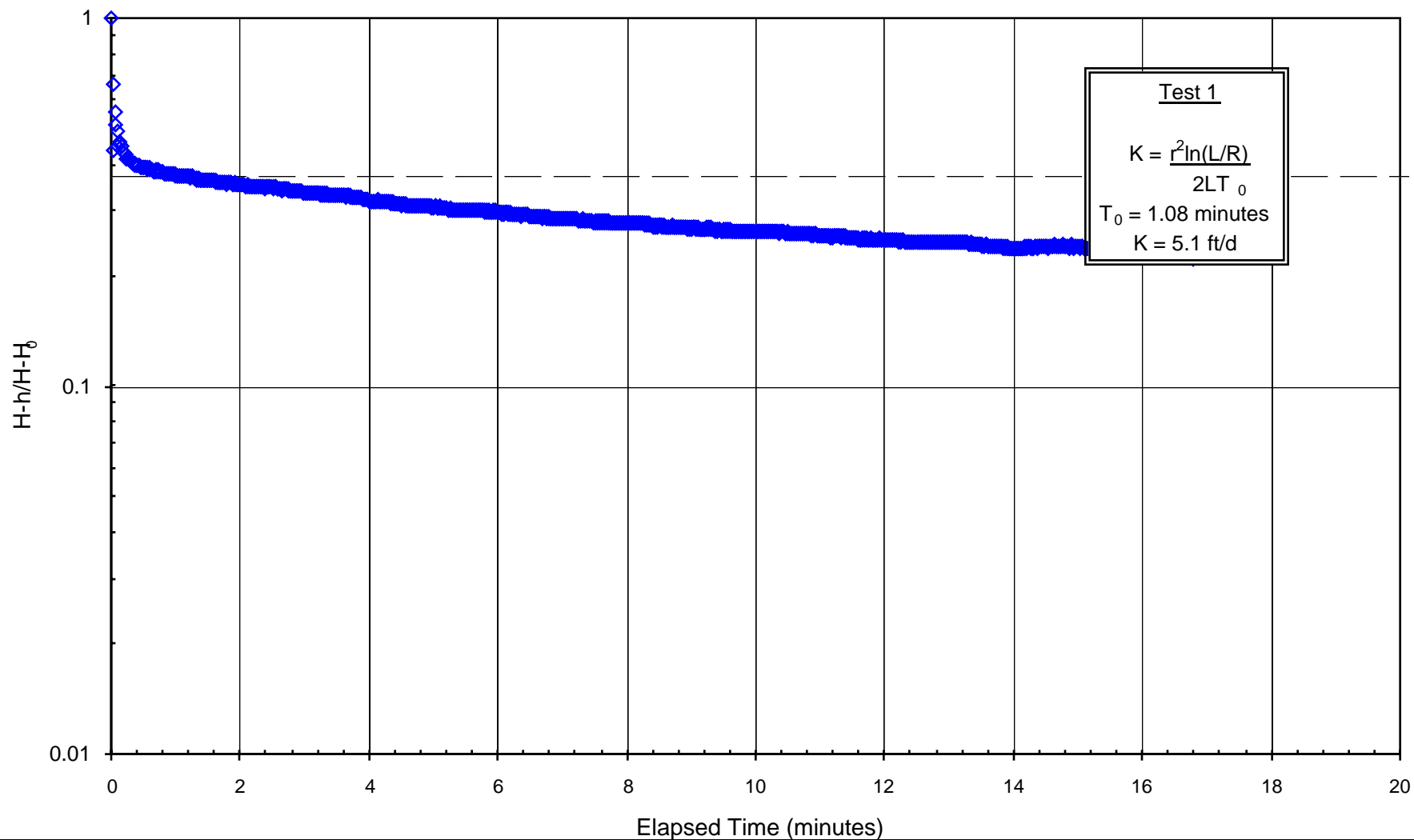
SCALE na

DWG. NO. na

REVIEWED DB

FILE NO. TW60 RHT.xls

FIGURE NO. C-4



Monsanto/New Monitoring

TITLE

TW-60 Test 1 Analysis

DRAWN MPK

DATE Oct-07

JOB NO. 913-1101.605

CHECKED DB

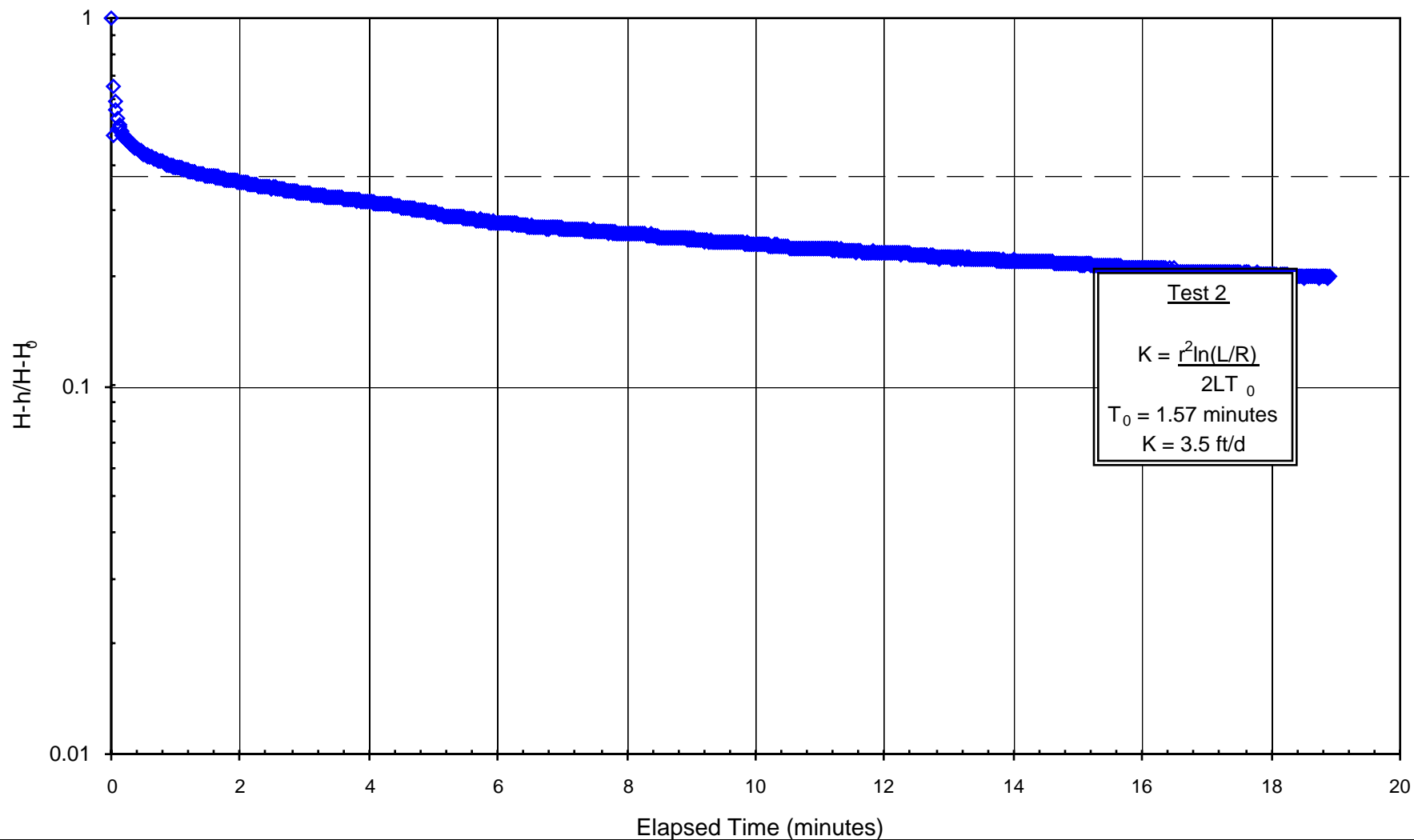
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REVIEWED DB

FILE NO. TW60 RHT.xls

FIGURE NO. C-5



Monsanto/New Monitoring Wells/ID

TITLE

TW-60 Test 2 Analysis

DRAWN MPK

DATE Oct-07

JOB NO. 913-1101.605

CHECKED DB

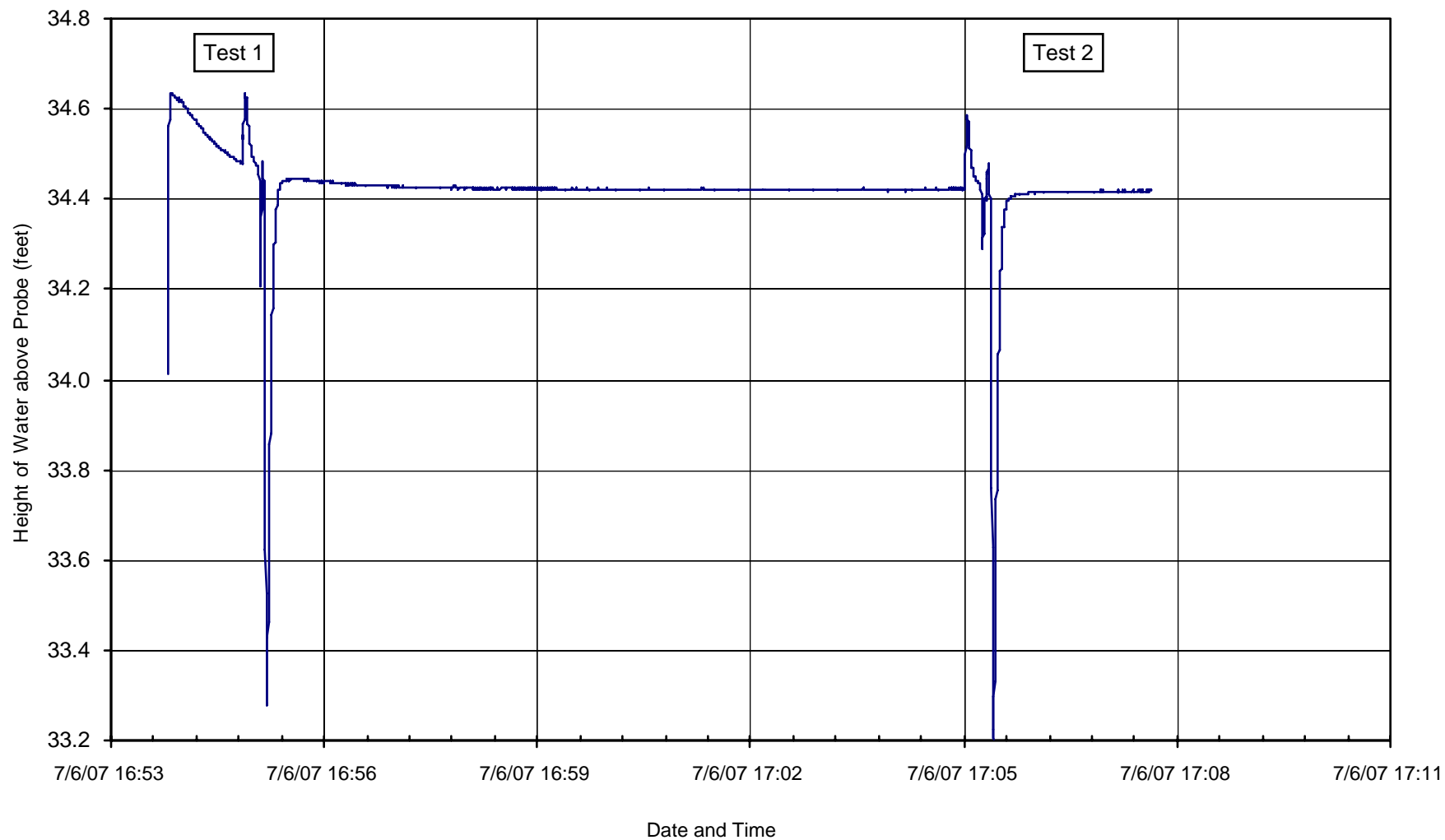
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FILE NO. TW60 RHT.xls

FIGURE NO. C-6



Monsanto/New Monitoring Wells/ID

TITLE

TW-61 Rising Head Test Hydrograph

DRAWN MPK

DATE Oct-07

JOB NO. 913-1101.605

CHECKED DB

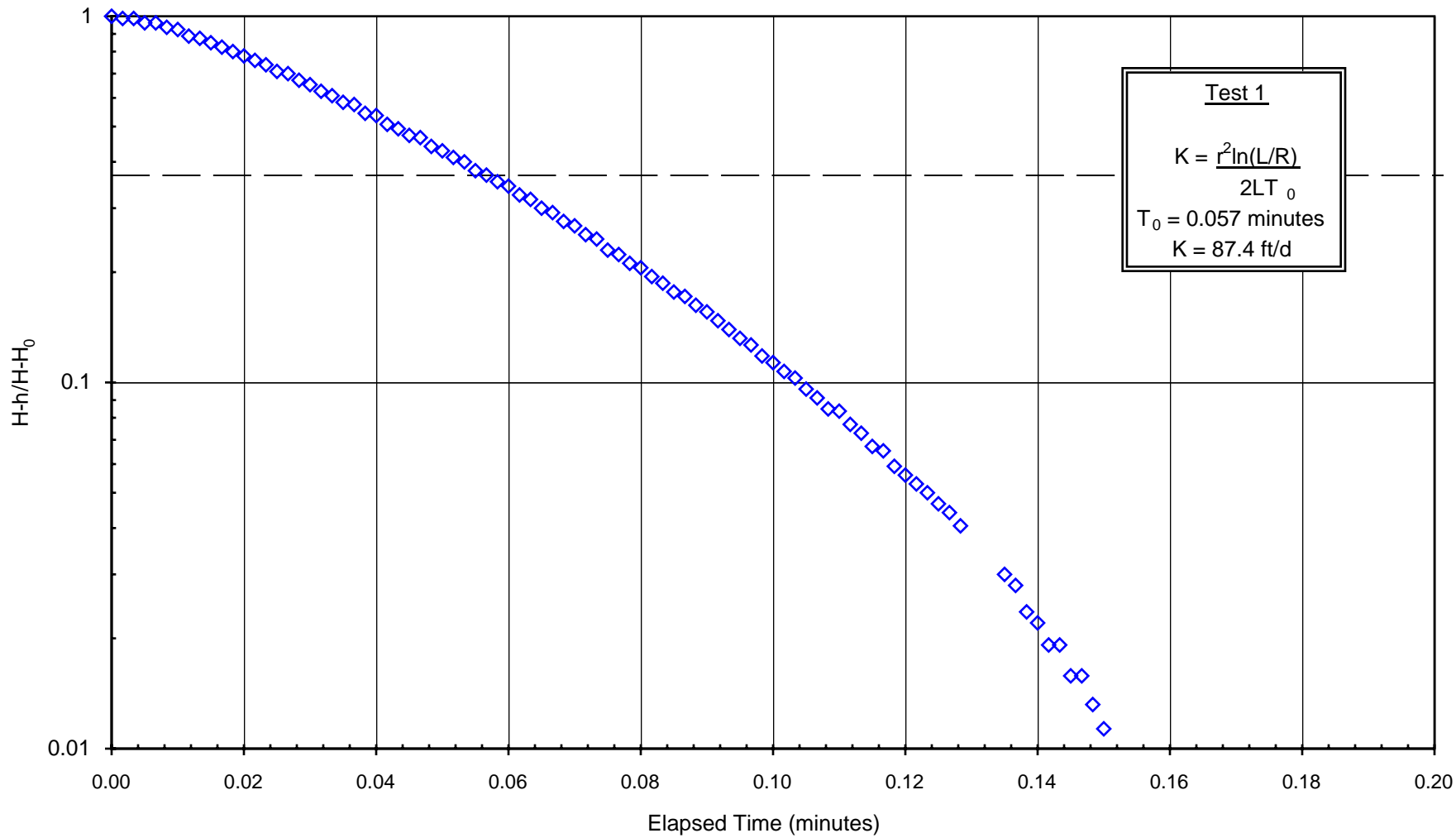
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FILE NO. TW61 RHT.xls

FIGURE NO. C-7



Monsanto/New Monitoring Wells/ID

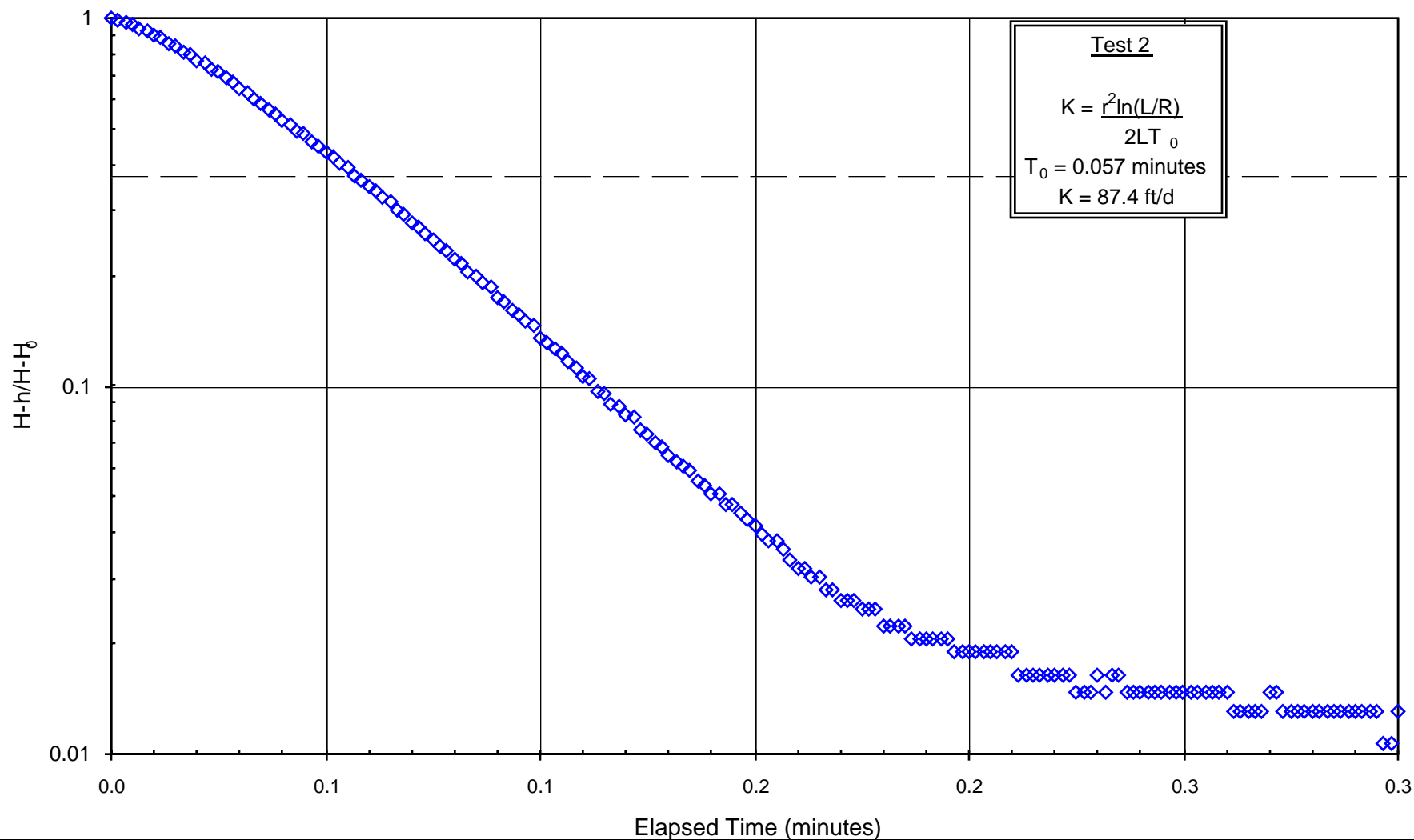
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TW-61 Test 1 Analysis

DRAWN MPK
 CHECKED DB
 REVIEWED DB

DATE Oct-07
 SCALE na
 FILE NO. TW61 RHT.xls

JOB NO. 913-1101.605
 DWG. NO. na
 FIGURE NO. C-8



Monsanto/New Monitoring Wells/ID

TITLE

TW-61 Test 2 Analysis

DRAWN MPK

DATE Oct-07

JOB NO. 913-1101.605

CHECKED DB

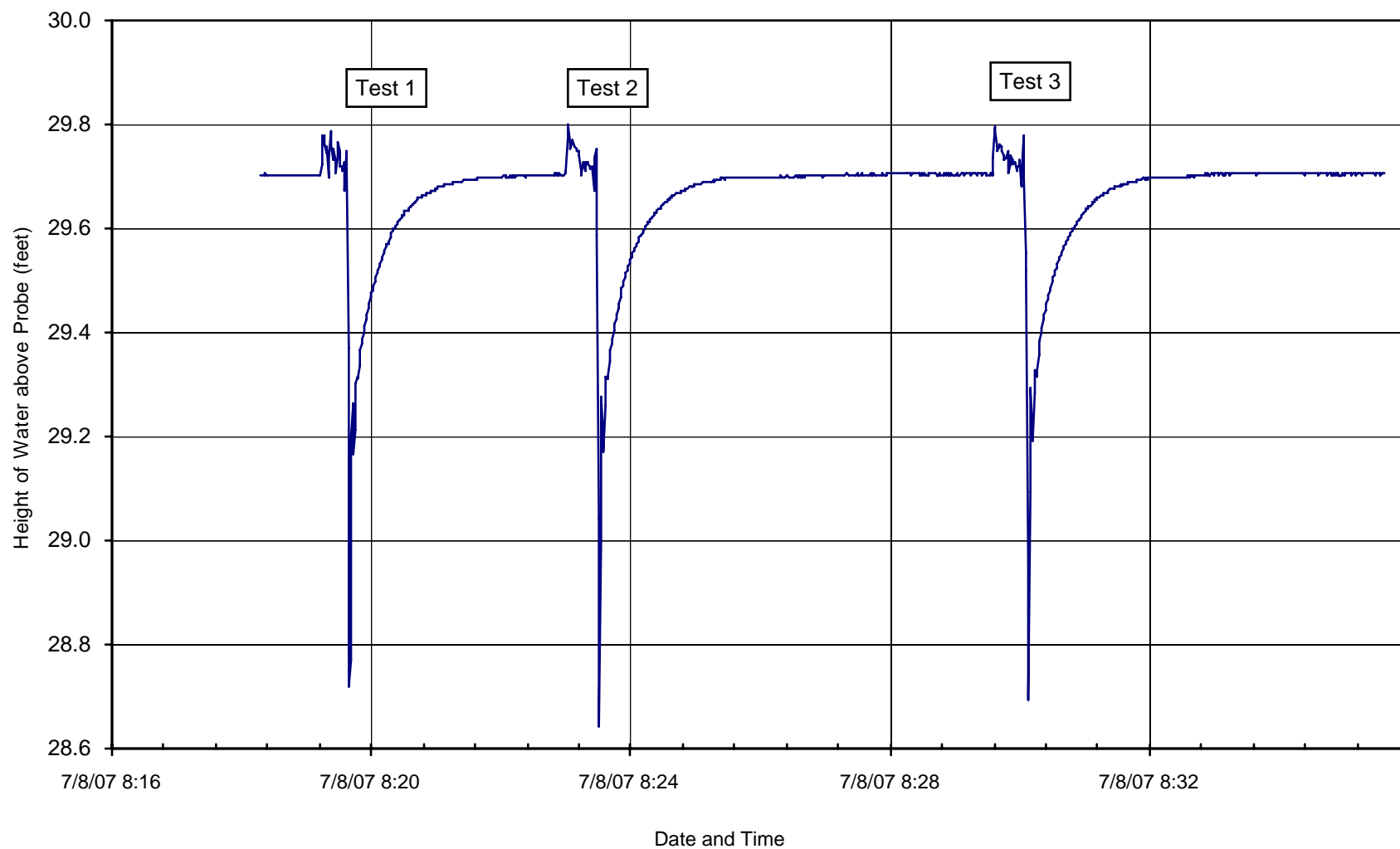
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REVIEWED DB

FILE NO. TW61 RHT.xls

FIGURE NO. **C-9**



Monsanto/New Monitoring Wells/ID

TITLE

TW-62 Rising Head Test Hydrograph

DRAWN MPK

DATE Oct-07

JOB NO. 913-1101.605

CHECKED DB

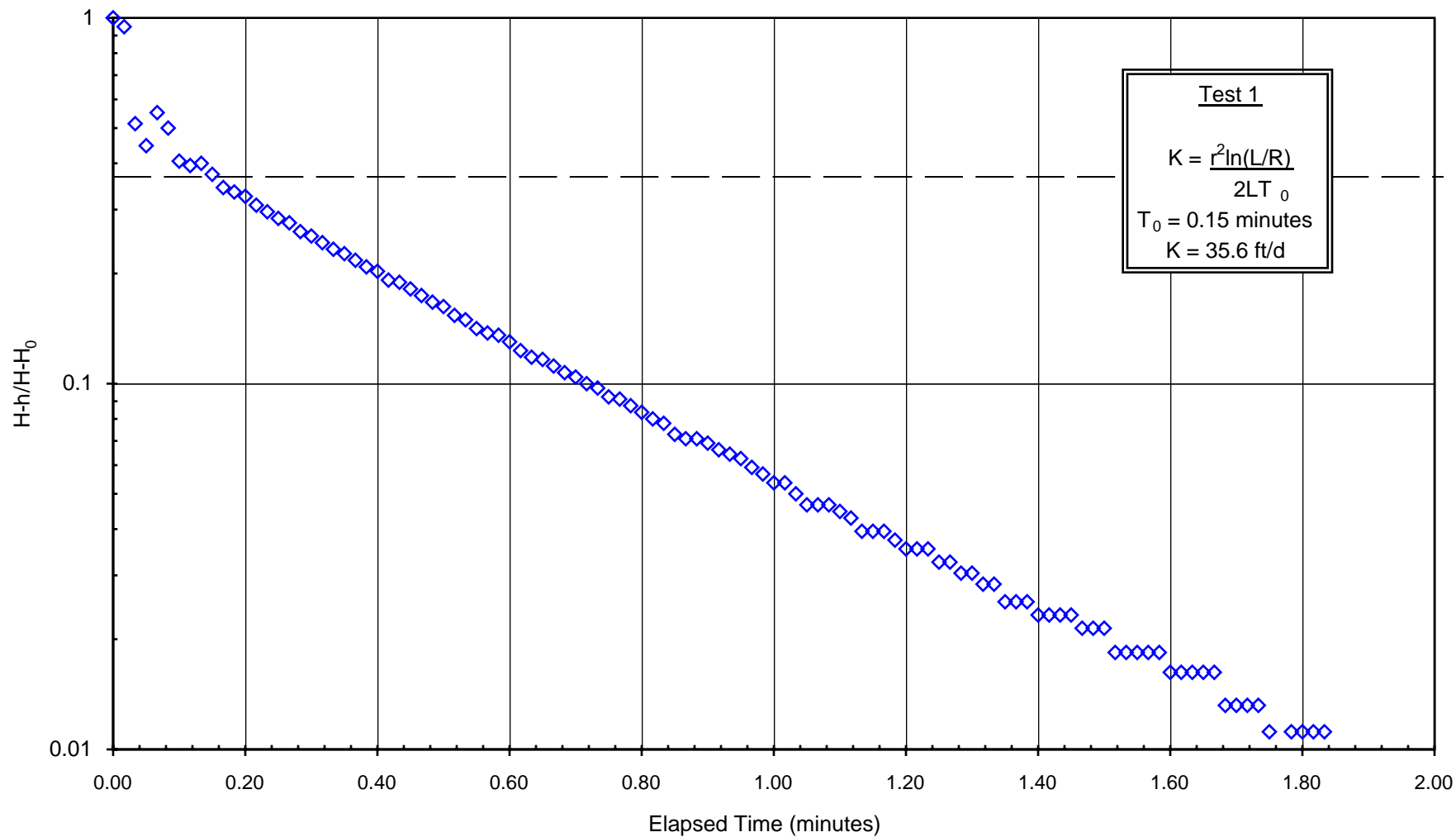
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REVIEWED DB

FILE NO. TW62 RHT.xls

FIGURE NO. C-10



Monsanto/New Monitoring Wells/ID

TITLE

TW-62 Test 1 Analysis

DRAWN
CHECKED
REVIEWED

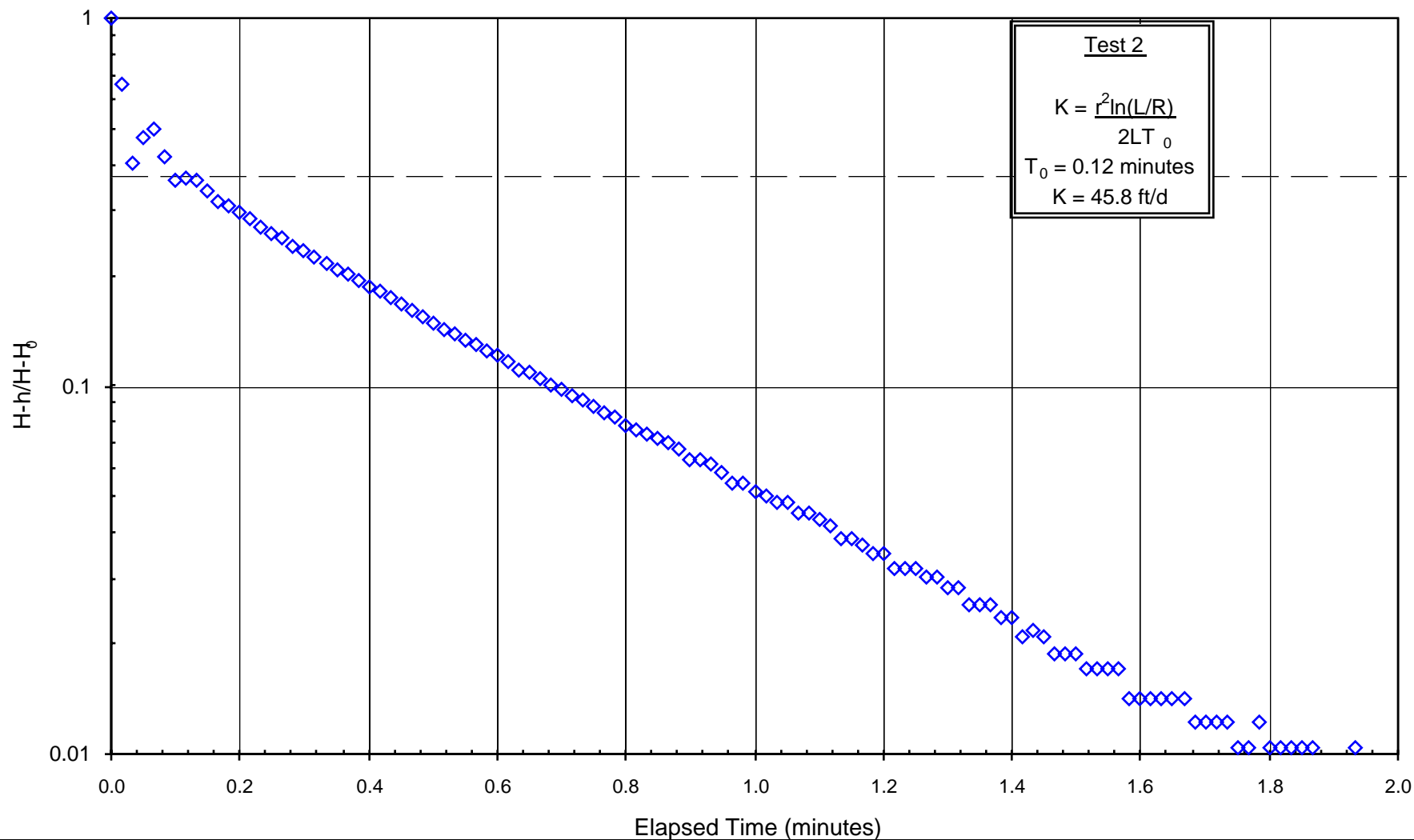
MPK
DB
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DATE
SCALE
FILE NO.

Oct-07
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TW62 RHT.xls

JOB NO.
DWG. NO.
FIGURE NO.

913-1101.605
na
C-11



Monsanto/New Monitoring Wells/ID

TITLE

TW-62 Test 2 Analysis

DRAWN MPK

DATE Oct-07

JOB NO. 913-1101.605

CHECKED DB

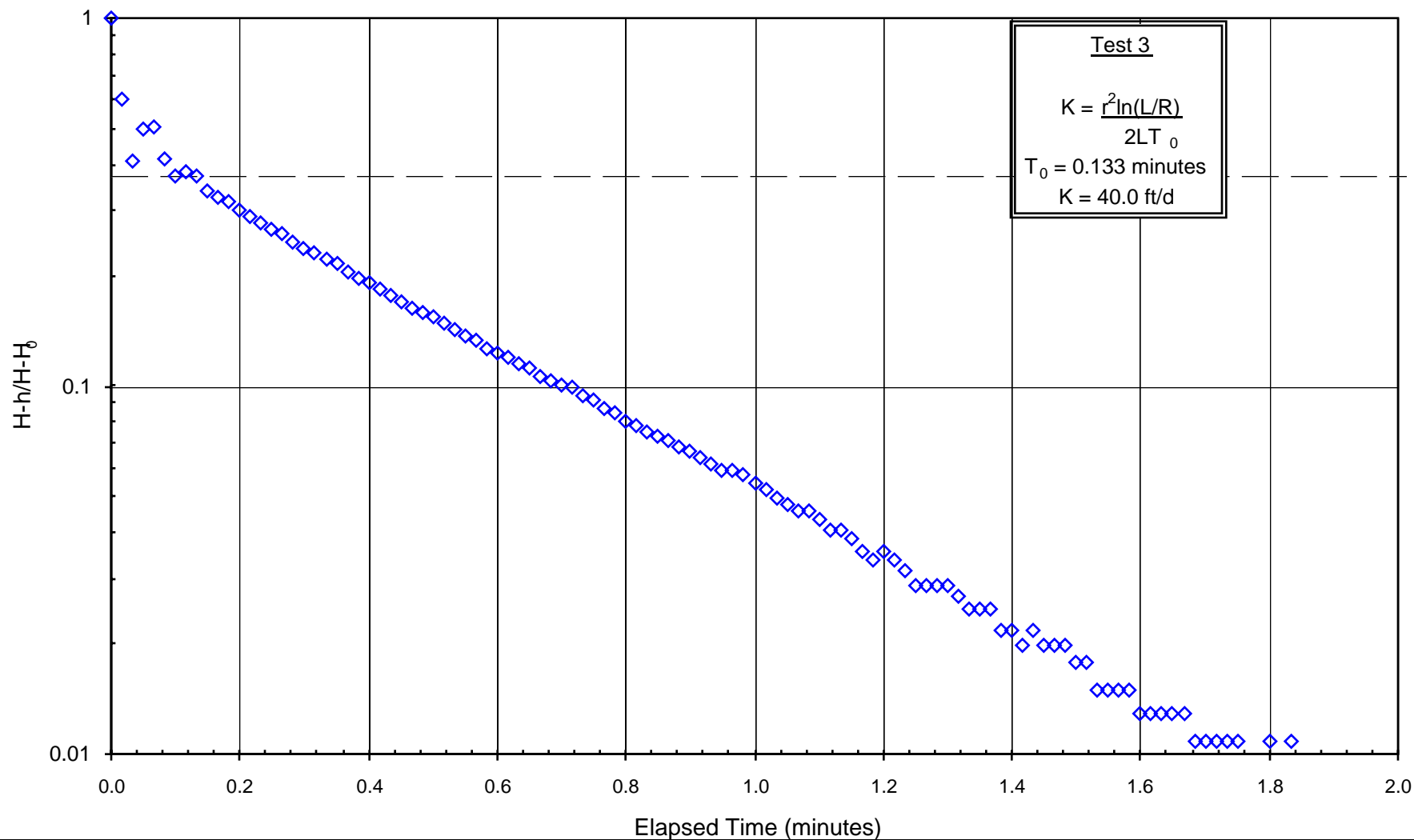
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REVIEWED DB

FILE NO. TW62 RHT.xls

FIGURE NO. C-12



Monsanto/New Monitoring Wells/ID

TITLE

TW-62 Test 3 Analysis

DRAWN
CHECKED
REVIEWED

MPK
DB
DB

DATE

Oct-07

SCALE

na

FILE NO.

TW62 RHT.xls

JOB NO.

913-1101.605

DWG. NO.

na

FIGURE NO.

C-13